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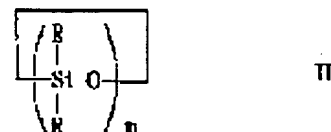
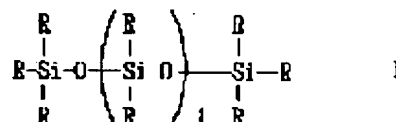
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(54) METHOD FOR CLEANING AND DEVICE THEREFOR

(57)Abstract:

PURPOSE: To obtain superior cleaning properties, draining properties, drying properties and the like by cleaning a material to be cleaned with an organic silicon cleaning agent composed of a specified low-molecular weight polyorganosiloxane and a cleaning agent composed of a nonaqueous basic cleaning agent to which a cleaning performance improving agent is added and then cleaning by means of the nonaqueous basic cleaning agent only.

CONSTITUTION: At the time of cleaning, a material to be cleaned is cleaned in a first process by using an organic silicon cleaning agent composed of a mixture of a straight-chain polydiorganosiloxane represented by formula I (R represents substituted or non-substituted monovalent hydrocarbon group, and I is an integer of 0-5) with a low-molecular weight polyorganosiloxane selected from cyclic polydiorganosiloxanes represented by formula II (R represents substituted or non-substituted hydrocarbon group, and (m) is an integer of 3-7), and a nonaqueous 4-30c aliphatic hydrocarbons mixture cleaning agent, to which a cleaning performance improving agent is added. Then the material is cleaned with the latter nonaqueous basic cleaning agent only, in the second cleaning process.



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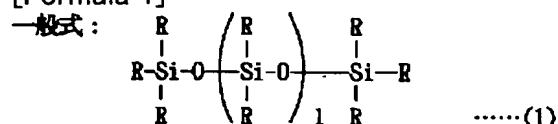
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CLAIMS

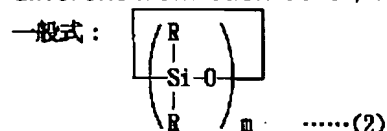
[Claim(s)]

[Claim 1]

[Formula 1]



They are the straight chain-like polydyorganosiloxane expressed with (the inside of a formula and R show the integer of 0- 5, as for a hydrocarbon group the same, the permutation which is different from each other, or univalent [unsubstituted], and I), and [Formula 2].



the inside of a formula and R are the same -- or -- difference -- a permutation or a hydrocarbon group univalent [unsubstituted] -- m the integer of 3-7 -- being shown -- it is chosen out of the annular polydyorganosiloxane expressed -- at least -- With the organic silicon system cleaning agent which becomes substantial, from one sort of low-molecular-weight polyorganosiloxanes Carbon number With the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30 The washing approach characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[Claim 2] Carbon number The washing approach characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent with the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic hydrocarbon system cleaning agent of 4-30.

[Claim 3] It is the washing approach characterized by said aliphatic hydrocarbon system cleaning agent being an isoparaffin system cleaning agent in the washing approach according to claim 1 or 2.

[Claim 4] Setting to the washing approach according to claim 3, said isoparaffin system cleaning agent is a carbon number. The washing approach characterized by becoming substantial from the volatile isoparaffin of 4-30.

[Claim 5] Said nonaqueous basic cleaning agent is the washing approach characterized by satisfying $\text{Wdg} > \text{Ddg} > \text{Odg}$ when the specific gravity Ddg sets the specific gravity of Wdg and fats-and-oils system dirt to Odg for the specific gravity of water in the washing approach according to claim 1 or 2.

[Claim 6] It is the washing approach characterized by said washing engine-performance improvers being a surfactant and/or a hydrophilic solvent in the washing approach according to claim 1 or 2.

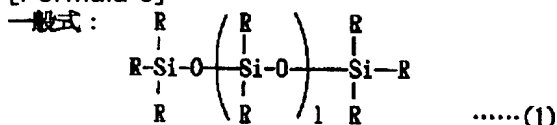
[Claim 7] It is the washing approach characterized by said 1st washing process being a cleaning washing process in the washing approach according to claim 1 or 2.

[Claim 8] It is the washing approach characterized by said 1st washing process being a ridge washing process in the washing approach according to claim 1 or 2.

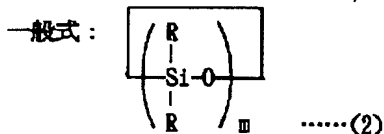
[Claim 9] The washing approach characterized by performing desiccation processing by warm air 60 degrees C or less in the washing approach according to claim 1 or 2 to said washed object which passed through said 2nd washing process.

[Claim 10]

[Formula 3]



They are the straight chain-like polydyorganosiloxane expressed with (the inside of a formula and R show the integer of 0- 5, as for a hydrocarbon group the same, the permutation which is different from each other, or univalent [unsubstituted], and I), and [Formula 4].



the inside of a formula and R are the same -- or -- difference -- a permutation or a hydrocarbon group univalent [unsubstituted] -- m the integer of 3-7 -- being shown -- it is chosen out of the annular polydyorganosiloxane expressed -- at least -- With the organic silicon system cleaning agent which becomes substantial, from one sort of low-molecular-weight polyorganosiloxanes Carbon number The 1st washing means which has a washing tub using the cleaning agent which added the washing engine-performance improver in the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, and washes a washed object by said washing tub to it, The washing station characterized by providing the 2nd washing means which washes said washed object which has the washing tub which used said nonaqueous basic cleaning agent independently, and passed through said 1st washing means by said washing tub.

[Claim 11] A carbon number The washing station characterized by to provide the 2nd washing means which washes said washed object which has a washing tub using the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic-hydrocarbon system cleaning agent of 4-30, has the washing tub which used independently the 1st washing means and said nonaqueous basic cleaning agent which washes a washed object by said washing tub, and passed through said 1st washing means by said washing tub.

[Claim 12] In a washing station according to claim 10 or 11, a washing effluent is introduced from either [at least] said 1st washing means or said 2nd washing means. The washing station characterized by providing further the cleaning agent playback means which distills this washing effluent and carries out separation recovery only of said nonaqueous basic cleaning agent, and a means to supply this nonaqueous basic cleaning agent by which separation recovery was carried out to either [at least] said 1st washing means or said 2nd washing means.

[Claim 13] It is the washing station characterized by said cleaning agent playback means having a filter as pretreatment of said distillation in a washing station according to claim 12.

[Claim 14] In a washing station according to claim 12 said 2nd washing means It has said two or more washing tubs connected so that said nonaqueous basic cleaning agent might be sent to the migration direction and hard flow of a washed object. The washing station characterized by being constituted so that said washing effluent may be sent out to said cleaning agent playback means

from the washing tub by the side of the lowest style among the washing tubs of these plurality and said nonaqueous basic cleaning agent by which separation recovery was carried out may be re-supplied to the washing tub of the maximum upstream.

[Claim 15] Said two or more washing tubs which said 2nd washing means has in a washing station according to claim 14 are washing stations characterized by being connected so that said nonaqueous basic cleaning agent may be sent according to either [at least] an overflow mechanism or a drain device.

[Claim 16] Said 1st washing means is a washing station characterized by being constituted so that it may have said two or more washing tubs connected so that said cleaning agent might be sent to the migration direction and hard flow of a washed object in a washing station according to claim 12 and said washing effluent may be sent out to said cleaning agent playback means from the washing tub by the side of the lowest style among the washing tubs of these plurality.

[Claim 17] The washing station characterized by being constituted so that a new cleaning agent may be supplied to the washing tub of the maximum upstream in a washing station according to claim 16 among said two or more washing tubs which said 1st washing means has.

[Claim 18] It is the washing station characterized by satisfying $Wdg > Ddg > Odg$ and said 1st washing means and the 2nd washing means possessing further a means to remove the water and fats-and-oils system dirt which were mixed into said cleaning agent according to an individual, respectively in a washing station according to claim 10 or 11 when, as for said nonaqueous basic cleaning agent, the specific gravity Ddg sets the specific gravity of Wdg and fats-and-oils system dirt to Odg for the specific gravity of water.

[Claim 19] It is the washing station characterized by providing a means to remove the water with which the sedimentation of said 1st washing means and the 2nd washing means was carried out under said cleaning agent in the washing station according to claim 18, and a means to remove the fats-and-oils system dirt by which floatation was carried out above said cleaning agent.

[Claim 20] The washing station characterized by providing further a desiccation means to perform desiccation processing by warm air 60 degrees C or less in a washing station according to claim 10 or 11 to said washed object which passed through said 2nd washing means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is chlorofluocarbon 113. It is related with the washing approach and washing station using a chlorofluocarbon system solvent [like], a chlorine-based solvent, and the nonaqueous cleaning agent that replaces lower alcohol.

[0002]

[Description of the Prior Art] As the desiccation approach after rinsing of metal components, a plated part, paint components, electronic parts, semi-conductor components, etc., it is chlorofluocarbon 113. The approach using the chlorofluocarbon system solvent represented as a ridge cleaning agent is common. Moreover, organic solvents, such as the above-mentioned chlorofluocarbon system solvent, and trichloroethane, a trichloroethylene, tetrachloroethylene, a carbon tetrachloride, are broadly used also as a cleaning agent for removing oil dirt etc.

[0003] however, chlorofluocarbon 12 and chlorofluocarbon 113 with ozone modulus of rupture high since it has become clear for emission of chlorofluocarbon to lead to destruction of an ozone layer, and to have serious effect on the body or a living system recently etc. -- use is gradually reduced on a scale of being worldwide, and it is progressing in the direction abolished in the future. Moreover, chlorine-based organic solvents, such as a trichloroethylene and tetrachloroethylene, are also advancing in the direction in which use regulation is tightened up involving an environmental problem, such as causing contamination of soil, an underground water, etc. Although it is under such a situation, the chlorofluocarbon system matter with ozone modulus of rupture lower than the present chlorofluocarbon system solvent is being developed and industrial production is already advanced partly, it is not regarded as the desirable alternative cleaning agent from there not being no destruction of these and an ozone layer.

[0004] Then, the cleaning agent of a drainage system using a surfactant, a hydrophilic solvent, etc. which cause neither environmental destruction nor environmental pollution is beginning to be improved as a substitute of the cleaning cleaning agent by organic solvent system which was mentioned above. However, in such a cleaning agent, penetrating power is weak, for example, there is a problem that sufficient detergency can be demonstrated to the oil dirt with which hyperviscosity stuck neither from the dirt which invaded into components details, nor inside viscosity.

[0005] Moreover, although the cleaning agent using various surfactants as a substitute of the ridge cleaning agent by the organic solvent system etc. is examined, the present condition is that the ridge effectiveness which is equal to a chlorofluocarbon system solvent is not acquired. Moreover, when the organic solvent system cleaning agent mentioned above is used as a ridge cleaning agent, the specific gravity of a cleaning agent becomes large, water also surfaces on a cleaning agent not to mention fats and oils, and an oil and water are separated from a cleaning agent in the form where it contacted mutually. Thus, about the oil and water which touch mutually, it is difficult to take these out separately, and the problem has arisen from the abandonment approaches of an oil and each water differing in respect of waste fluid processing. Moreover, since the cleaning agent using a surfactant etc. has high compatibility with water, it is very difficult to carry out separation purification and to carry out the reuse of these cleaning

agents.

[0006] On the other hand, the device in which various washing processes, such as soak cleaning, evaporation washing, and shower washing, are put in block in the washing station which used the conventional cleaning agent is adopted, and although raising washing effectiveness is also performed, it is the requisite to use the cleaning agent of a single class to the last. This will be because recovery and the reuse of a cleaning agent become difficult, if two or more cleaning agents are used within a series of washing processes. This serves as a serious failure, when it is going to realize the cleaning effect which cannot be demonstrated, for example if independent by using two or more cleaning agents.

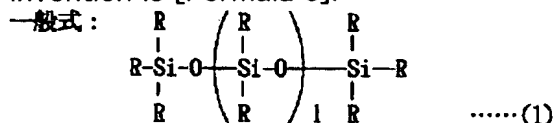
[0007]

[Problem(s) to be Solved by the Invention] As mentioned above, organic solvent system cleaning agents, such as a chlorofluocarbon system solvent, had the serious fault of causing environmental destruction, among the conventional cleaning agents containing a ridge cleaning agent. Moreover, the cleaning agent of the present condition currently examined as a substitute of these organic solvent system had the problem that sufficient effectiveness was not acquired. On the other hand, in the conventional washing approach or a washing station, there was a difficulty in respect of the removed abandonment of reuse of a cleaning agent, water, or the dirt matter. Furthermore, when it was going to reuse the cleaning agent efficiently, it had the difficulty that it becomes difficult to use two or more different cleaning agents.

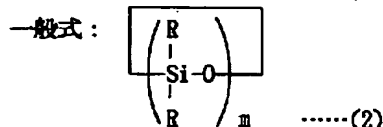
[0008] This invention is made in order to cope with the technical problem which the conventional washing approach and a washing station which were mentioned above are holding, and it aims at offering the washing approach and washing station which are equal to washing which used the chlorofluocarbon system solvent etc. and with which detergency, water replaceability, drying, etc. are acquired. Moreover, in using two or more cleaning agents, other purposes of this invention are to offer the washing approach and washing station which enabled reuse of a cleaning agent. Furthermore, other purposes of this invention are to offer the washing approach and washing station which made it possible to discard efficiently the water removed from the washed object, and the dirt matter.

[0009]

[Means for Solving the Problem and its Function] That is, the 1st washing approach in this invention is [Formula 5].



They are the straight chain-like polydyorganosiloxane expressed with (the inside of a formula and R show the integer of 0- 5, as for a hydrocarbon group the same, the permutation which is different from each other, or univalent [unsubstituted], and I), and [Formula 6].



the inside of a formula and R are the same -- or -- difference -- a permutation or a hydrocarbon group univalent [unsubstituted] -- m the integer of 3-7 -- being shown -- it is chosen out of the annular polydyorganosiloxane expressed -- at least -- With the organic silicon system cleaning agent which becomes substantial, from one sort of low-molecular-weight polyorganosiloxanes Carbon number With the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30 It is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0010] Moreover, the 2nd washing approach in this invention is a carbon number. It is the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic hydrocarbon system cleaning agent of 4-30, and is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0011] The 1st washing station in this invention was described above. (1) type The organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, Carbon number The 1st washing means which has a washing tub using the cleaning agent which added the washing engine-performance improver in the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, and washes a washed object by said washing tub to it, It has the washing tub which used said nonaqueous basic cleaning agent independently, and is characterized by providing the 2nd washing means which washes said washed object which passed through said 1st washing means by said washing tub.

[0012] Moreover, the 2nd washing station in this invention is a carbon number. It has a washing tub using the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic hydrocarbon system cleaning agent of 4-30. It is characterized by providing the 2nd washing means which washes the 1st washing means which washes a washed object by said washing tub, and said washed object which has the washing tub which used said nonaqueous basic cleaning agent independently, and passed through said 1st washing means by said washing tub.

[0013] As a cleaning agent used for the 1st washing process of this invention, a ridge cleaning agent which enables separation of moisture, for example, the cleaning cleaning agent used for removal of fats-and-oils dirt are illustrated. the nonaqueous basic cleaning agent used here was mentioned above -- as -- (1) type The organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, and carbon number Mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, or carbon number It is the aliphatic hydrocarbon system cleaning agent of 4-30. As a washing engine-performance improver, the surfactant which gives and raises the washing engine performance and the ridge engine performance, a hydrophilic solvent, etc. are illustrated by adding, for example to the above-mentioned nonaqueous basic cleaning agent. Moreover, fundamentally, the 2nd washing process of this invention business--does the above-mentioned nonaqueous basic cleaning agent too much, and turns into a washing process.

[0014] The above-mentioned low-molecular-weight polyorganosiloxane shows good replaceability with water, and has vaporization by warm air 60 degrees C or less, and drying while it has these outstanding penetrating power over the details of various washed objects, such as metal components, electronic parts, semi-conductor components, and paint components, and volatility and gives rust-proofing nature, even when it is independent. In addition, the above The polydyorganosiloxane which has the straight chain-like structure expressed with (1) type, and the above The polydyorganosiloxane which has the cyclic structure expressed with (2) types can also be used in common.

[0015] the above (1) type -- and -- Inside of (2) types R -- a permutation or unsubstituted a univalent hydrocarbon group -- it is -- for example, alkyl groups, such as a methyl group, an ethyl group, a propyl group, and butyl, a phenyl group, etc. A univalent unsubstituted hydrocarbon group, a univalent trifluoromethyl radical, etc. Although a univalent permutation hydrocarbon group etc. is illustrated, the stability of a system, volatile maintenance, etc. to a methyl group is the most desirable. As the above-mentioned low-molecular-weight polyorganosiloxane, what has cyclic structure is desirable, and octamethylcyclotetrasiloxane, decamethyl cyclopentasiloxane, and such mixture are still more suitable.

[0016] moreover, the thing for which the above-mentioned low-molecular-weight polyorganosiloxane chooses the molecular structure suitably -- the specific gravity Ddg of the cleaning agent -- the following the (A) type -- or -- The (B) type can be satisfied.

[0017] $Wdg > Ddg$ (A) $Wdg > Ddg > Odg$.. (B) (Ddg shows the specific gravity of target fats-and-

oils [specific gravity / of a nonaqueous basic cleaning agent / Wdg / specific gravity / of water / Odg] system dirt among a formula)

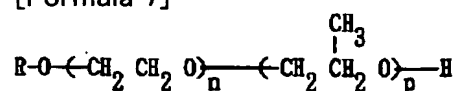
For example, By satisfying the (B) type, it becomes possible to separate water and fats-and-oils system dirt, and purification and waste fluid processing of a cleaning agent become easy.

[0018] A carbon number the above-mentioned aliphatic hydrocarbon system cleaning agent It consists of aliphatic hydrocarbon (below, it is only described as an aliphatic hydrocarbon system cleaning agent) of the shape of the shape of branching of the range of 4-30, or a straight chain, for example, a carbon number The isoparaffin system cleaning agent of 4-30 is mentioned. as this isoparaffin system cleaning agent, what becomes substantial mentions from volatile isoparaffin -- having -- especially -- The isoparaffin which makes a subject the fraction of C4 - C15 is desirable from the point of the washing engine performance. an isoparaffin system cleaning agent -- the above-mentioned volatile isoparaffin one sort -- or -- It is used as two or more sorts of mixture. Such an aliphatic hydrocarbon system cleaning agent is harmlessness and no odor, and shows the same effectiveness as the above-mentioned organic silicon system cleaning agent while they have volatility.

[0019] You may use it independently, and it mixes with an organic silicon system cleaning agent, and the aliphatic hydrocarbon system cleaning agent hung up as the above-mentioned nonaqueous basic cleaning agent can also be used as a nonaqueous basic cleaning agent. For example, if aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are blended with an organic silicon system cleaning agent, while the effectiveness of reducing the congealing point sharply will be acquired and making use in a cold district easy, improvement in the washing engine performance can also be aimed at.

[0020] A surfactant, a hydrophilic solvent, etc. are illustrated to have mentioned above as a washing engine-performance improver which carries out addition combination in a nonaqueous basic cleaning agent which was described above. Although a surface active agent is classified into a cation system, an anion system, the Nonion system, both-sexes systems, and these multicomputer systems according to the chemical structure which demonstrates activity, it is possible to use those all in this invention. Especially these surfactants are contributed to improvement in detergency. As what is preferably used in this invention among these surfactants Anion system surfactants, such as a polyoxyalkylene alkyl ether sulfonate and phosphoric ester, Polyhydric-alcohol fatty acid ester, polyoxyalkylene fatty acid ester, The Nonion system surfactants, such as polyoxyalkylene alkyl ether, Cation system surfactants, such as amphoteric surface active agents, such as an imidazoline derivative, an alkylamine salt, and alkyl quarternary ammonium salt, etc. are illustrated, and although it is rare to exist in others by the single matter, a terpene system compound, higher-fatty-acid ester, etc. which are extracted from a natural product are mentioned. Moreover, it is also possible to use the synthetic compound which replaced a part of chemical structure of various compounds which were mentioned above by the fluorine atom or the silicon atom.

[0021] Moreover, what has compatibility to the above-mentioned nonaqueous basic cleaning agent as a hydrophilic solvent is used, and especially the flash point is suitable for a thing 40 degrees C or more practically. As such a hydrophilic solvent, polyhydric alcohol, such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, the ethylene glycol monopropyl ether, ethylene glycol monobutyl ether, ethylene-glycol-monobutyl-ether acetate, and the diethylene-glycol monobutyl ether, the derivative of those, etc. are illustrated, and especially the diethylene-glycol monobutyl ether is desirable from points, such as compatibility with a nonaqueous basic cleaning agent, and safety to the body. In order that volatility may improve under coexistence with low-molecular-weight polyorganosiloxane etc., the water displacement only in this combination article and desiccation are also possible for these compounds. Moreover, it is also possible to use lower alcohol, an acetone, etc. like ethyl alcohol depending on the class and application of a nonaqueous basic cleaning agent. Furthermore, [Formula 7]



(-- the inside of a formula, and R -- carbon number [] -- the univalent hydrocarbon group of 1-12 is shown -- n and p are the integers of 0-10, respectively, and satisfy $n+p \geq 1$ --) -- in case aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are used for the polyoxyalkylene alkyl ether expressed as a nonaqueous basic cleaning agent, it is suitable.

[0022] The nonaqueous basic cleaning agent and washing engine-performance improver which were mentioned above shall be fundamentally used [the 1st washing process / the 2nd washing process] for a nonaqueous basic cleaning agent by the nonaqueous basic cleaning agent independent as a thing which added the washing engine-performance improver. A nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination according to an application, for example, in case it is used as a cleaning cleaning agent, what blended a surfactant, a hydrophilic solvent, or these both with the nonaqueous basic cleaning agent is suitable. A washing engine-performance improver which was described above to this can be blended and used, using the mixture of an organic silicon system cleaning agent and aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, as a nonaqueous basic cleaning agent. Moreover, although it is also possible to use it by the nonaqueous basic cleaning agent independent in case it is used as a ridge cleaning agent, what added the surfactant and the hydrophilic solvent is desirable. Especially a hydrophilic solvent is suitable. In addition, what it is not necessary to make it not necessarily in agreement for example, and an organic silicon system cleaning agent is used at the 1st washing process, and uses an aliphatic hydrocarbon system cleaning agent at the 2nd washing process is possible for the nonaqueous basic cleaning agent in the 1st washing process, and the nonaqueous basic cleaning agent in the 2nd washing process.

[0023] Moreover, although a nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination which was mentioned above, mixing in consideration of each solubility is desirable. For example, the difference of a solubility factor (SP value is called hereafter) It is desirable to combine so that it may become four or less. Moreover, in case the difference of SP value mixes large liquid entirety, the liquid which has in-between SP value may be blended as a mixed medium.

[0024] Especially the compounding ratio of the surfactant mentioned above is a nonaqueous basic cleaning agent, in case it is used as a cleaning cleaning agent, although not limited. Below 50 weight sections are below 20 weight sections desirable still more preferably to the 100 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. Below 20 weight sections are to a pan to the 100 weight sections. They are below 3 weight sections. the time of on the other hand, using it as a cleaning cleaning agent, although especially the compounding ratio of a hydrophilic solvent is not limited, either -- nonaqueous basic cleaning agent the 100 weight sections -- receiving -- 50000 below the weight section -- desirable -- further -- desirable -- They are below the 10000 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. As opposed to the 100 weight sections Below the 100 weight sections are below 50 weight sections desirable still more preferably. In the washing approach of this invention, a washing process is completed by performing desiccation processing after a washing process which was mentioned above. As this desiccation down stream processing, effectiveness comparatively sufficient also by warm air desiccation at low temperature, such as 60 degrees C or less, is acquired. Moreover, it may replace with warm air desiccation and steam seasoning by steamy cleaning agents, such as isopropyl alcohol (it is hereafter described as IPA), may be performed. According to steam seasoning, desiccation finishing can be made more into fitness and it is suitable for precision washing etc. Moreover, as a washed object set as the object of this invention, it is a metal, the ceramics, plastics, etc. and they are still more specifically metal components, surface treatment components, electronic parts, semi-conductor components, an electrical part, a precision machinery component, an optic, glass components, ceramic components, etc.

[0025] Moreover, the washing station of this invention is characterized by providing the 1st washing means by the cleaning agent which added the washing engine-performance improver to

the nonaqueous basic cleaning agent mentioned above, and the 2nd washing means by the above-mentioned nonaqueous basic cleaning agent. Moreover, desiccation means, such as warm air desiccation, are established after the 2nd washing means. And in spite of using two or more cleaning agents by establishing the means which carries out separation recovery only of the nonaqueous basic cleaning agent from the mixture of the nonaqueous basic cleaning agent collected from the above 1st and the 2nd washing means, and a washing engine-performance improver, it becomes possible to collect and reuse a cleaning agent efficiently. Moreover, the nonaqueous basic cleaning agent by which separation recovery was carried out is re-supplied to the 1st washing means or the 2nd washing means by the re-supply means. Furthermore, by establishing a means to remove the fats-and-oils system dirt by which floatation was carried out above a means to remove the moisture by which sedimentation was carried out under the cleaning agent, or a cleaning agent, it is efficient and water and fats-and-oils system dirt which were separated from the washed object can be discarded separately. In addition, it is possible for an immersion tub, a spray tub, etc. to be illustrated and to use together a supersonic wave, rocking, mechanical agitation, etc. as the above-mentioned washing means.

[0026]

[Example] Hereafter, an example explains this invention to a detail more.

[0027] Drawing 1 is drawing showing the configuration of the washing station of one example of this invention. The washing station shown in this drawing is divided roughly, and consists of washing and a water displacement process A, a defecation / ridge process B, and a cleaning agent playback device C. The 1st washing tub 1, and the 2nd washing tub 2 and liquid end tub 3 having a sedimentation function and overflow isolation are prepared in washing and the water displacement process A used as the 1st process.

[0028] although the washing tub 1 of the above 1st and the 2nd washing tub 2 have a sedimentation function and overflow isolation and this has adhered to the washed object X -- a class -- choosing -- ****ing -- sedimentation functional independence and overflow isolation -- even when it is independent, depending on a washed object, it fully functions. Moreover, the number of tubs in a multi-tub connection tub of the washing tub in the 1st process etc. is [that what is necessary is just to choose from a single tub or a multi-tub connection tub according to washing time amount, washing quality, etc.] the same.

[0029] Also in this example, the multi-tub connection tub of two tubs is used, and it is connected by drain-piping 2a and overflow pipe 2b between the 1st washing tub 1 and the 2nd washing tub 2. moreover -- the 1st washing tub 1 and the 2nd washing tub -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together and the washing engine performance improves more by these.

[0030] Ridge cleaning agent D1 which added the surfactant to the nonaqueous basic cleaning agent which becomes the above 1st and the 2nd washing tub 1 and 2 from aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above and an isoparaffin system cleaning agent, such mixture, etc. It holds, respectively. Ridge cleaning agent D1 containing this surfactant That specific gravity is set up more greatly than fats-and-oils system dirt smaller than water. Therefore, the sedimentation of the water Y carried in with the washed object X is carried out under the cleaning agent D1 held in the 1st and 2nd washing tubs 1 and 2, respectively. Moreover, fats-and-oils system dirt Z is the cleaning agent D1 held in the 1st and 2nd washing tubs 1 and 2. Floatation is carried out to the upper part, respectively.

[0031] The water Y by which sedimentation was carried out by the 2nd washing tub 2 is intermittently discharged by drain-piping 2a at the 1st washing tub 1 side. Moreover, the water Y by which sedimentation was carried out by the 1st washing tub 1 is discharged to the cleaning agent playback device C later mentioned intermittently by drain piping 4. Moreover, drain-piping 3a prepared in the liquid end tub 3 is also connected with the cleaning agent playback device C. Moreover, dirt Z of the fats-and-oils system by which floatation was carried out by the 1st washing tub 1 and the 2nd washing tub 2 carries out sequential overflow, and is discharged out of a system from the overflow pipe 5 formed in the 1st washing tub 1.

[0032] Ridge cleaning agent D1 held in the 1st washing tub 1 and the 2nd washing tub 2 It is sampled from the 1st washing tub 1 by piping 6a for circulation, and is a cleaning agent D1 by

the filter 6. After an inner solid-state object, a water particle, a non-dissolved solid, etc. are removed, it flows back in the 2nd washing tub 2. By circulation through this filter 6, it is a cleaning agent D1. Cleaning agent D1 of the washing tub 2 which is always purified and serves as the downstream on a washing process. It is supposed that it is possible to maintain a purer condition.

[0033] For example, cleaning agent D1 Separation removal of the moisture currently mixed in inside as waterdrop is easily carried out with the above-mentioned filter 6. although the above-mentioned filter 6 is variously chosen by the ingredient and the contents for washing / ridge -- for example -- 0.1-20 micrometers the microporous ceramic filter which has the pore size of extent, a glass filter, and the filter of an organic macromolecule system -- these multicomputer system filters etc. are used further preferably.

[0034] Moreover, the 3rd washing tub 7 and shower rinse tub 8 are prepared in defecation / ridge process B used as the 2nd process. Under the shower rinse tub 8, the buffer tank 9 is formed and it is connected by drain-piping 9a and overflow pipe 9b between this buffer tank 9 and the 3rd washing tub 7. this 3rd washing tub 7 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together.

[0035] Cleaning agent D2 of only the nonaqueous basic cleaning agent used for the washing tub 7 of the above 3rd at the process A of the above 1st It holds. In addition, the concrete class of nonaqueous basic cleaning agent is made the same as that of the nonaqueous cleaning agent used at the process A of the above 1st. This cleaning agent D2 That specific gravity is set up more greatly than the dirt of a fats-and-oils system smaller than water. Therefore, Water Y is a cleaning agent D2 like the washing tub in the 1st process A. Sedimentation is carried out to a lower part, and dirt Z of a fats-and-oils system is a cleaning agent D2. Floatation is carried out to the upper part. The water Y by which sedimentation was carried out by the 3rd washing tub 7 is intermittently discharged by drain piping 10 to the cleaning agent playback device C. Moreover, dirt Z of the fats-and-oils system by which floatation was carried out by the 3rd washing tub 7 is discharged out of a system from an overflow pipe 11.

[0036] Moreover, cleaning agent D2 held in the 3rd washing tub 7 It always circulates through the filter 12 and is a cleaning agent D2 by this filter 12. An inner solid-state object, a water particle, a non-dissolved solid, etc. are removed.

[0037] Next, recovery and the reuse of the cleaning agent in the above-mentioned washing station are explained.

[0038] As mentioned above, each drain piping 4, 3a, and 10 prepared in the 1st, 2nd, and 3rd washing tubs 1, 2, and 7 and liquid end tub 3 is connected to the cleaning agent playback device C. Cleaning agent D1 held in each washing tub Or D2 Although always purified by filters 6 and 12, when the dirt of a cleaning agent becomes severe, it is sent to the cleaning agent playback device C by each drain piping 4 and 10 with a conveying pump 13, and fractional distillation purification is carried out. Moreover, cleaning agent D1 collected on the liquid end tub 3 It is intermittently sent to the cleaning agent playback device C. By the cleaning agent playback device C, separation with a liquid and a solid-state is first performed by the filter 14, a part for a solid-state is discarded and only a liquid is sent to a distiller 15. In this distiller 15, separation is performed using the difference of the boiling points, such as each component in a cleaning agent, water, and fats-and-oils system dirt. Moreover, the moisture which remained with the distiller 15 is further separated by the decanter 16. In addition, before introducing into a distiller 15, separation removal of moisture may be beforehand performed by a coalescer etc. It sets here to the cleaning agent currently used with the above-mentioned washing station, and is the ridge cleaning agent D1. Cleaning agent D2 of only a nonaqueous basic cleaning agent In order to add a surfactant, it is a cleaning agent D1. And cleaning agent D2 The separation extract of the nonaqueous basic cleaning agent D2, i.e., the cleaning agent, can be carried out from each, and it is a cleaning agent D2. It is reproduced. Moreover, this reproduced cleaning agent D2 The component of an except, i.e., a surfactant, moisture, etc., is discarded. This reproduced cleaning agent D2 It is a cleaning agent D1 by piping 17 to the shower rinse tub 8, the 3rd washing tub 7, or the 2nd washing tub 2. It is sent to the combination machine 18 to supply.

[0039] At the shower rinse tub 8, it is the above-mentioned playback cleaning agent D2. Or new cleaning agent D2 sent from the cleaning agent charging line 19 Cleaning agent D2 which does not contain an impurity Shower washing is performed. Moreover, with the combination machine 18, they are playback or the new cleaning agent D2. The new surfactant sent from the surfactant charging line 20 or the cleaning agent with which the surfactant was blended thickly in advance is mixed, and it is newly a cleaning agent D1. It is prepared. This cleaning agent D1 The 2nd washing tub 2 is supplied if needed.

[0040] The washing process in the washing station which has the above-mentioned configuration is as being shown below. When moisture Y and fats-and-oils system dirt Z have adhered to the washed object X, it is first immersed in the 1st washing tub 1 of the 1st process A, and the 2nd washing tub 2 in order, and the permutation of the removal, and moisture Y and a ridge cleaning agent of fats-and-oils system dirt Z is performed. Then, cleaning agent D1 which has adhered to the washed object X front face on the liquid end tub 3 It is removed.

[0041] Next, cleaning agent D2 which does not contain an impurity by the shower rinse tub 8 after a ridge is performed, while the surfactant which is sent to the 2nd process B and remains on the washed object X front face by the 3rd washing tub 7 was removed Shower washing is performed and final surface purification and a surface final ridge are performed.

[0042] Then, desiccation processing is performed with the warm air oven which omitted illustration, and a washing process is completed. Moreover, it may replace with this warm air desiccation, and steam seasoning (washing) by IPA etc. may be performed.

[0043] By the way, this invention persons are ***** to especially the following point being effective in this system, when performing steamy washing (desiccation). That is, they are the difference of the latent heat of vaporization of the latent heat of vaporization of the compatibility of ** steamy cleaning agent and the liquid carried in from a last process, and ** steamy cleaning agent and a steamy cleaning agent, and the liquid carried in from a last process, and the point that ** boiling point must be taken into consideration. Although the hydrogen bond of molecules and the interaction of a polar group may have to be further taken into consideration about the above-mentioned **, the difference of SP value with the liquid carried in from a last process It turned out that it becomes an effective factor especially to use four or less steamy cleaning agent. As for this, the difference of SP value with the liquid which is because it is carried out by melting the liquid adhering to a washed object and washing away, and is carried in from a steamy cleaning agent and a last process into the steamy cleaning agent which dewed on the washed object front face steamy washing If 4 is exceeded, sufficient replaceability will no longer be acquired. Difference of more desirable SP value It is three or less and is to a pan. It is two or less.

[0044] Moreover, about **, the difference of the latent heat of vaporization with the liquid carried in from a last process It is desirable to use a 5 or less-time steamy cleaning agent. That is, the difference of the latent heat of vaporization If 5 times are exceeded, since vapor rates differ greatly, the large liquid of the latent heat of vaporization will remain on a washed object, and possibility of remaining as silverfish etc. will become large. Difference of the more desirable latent heat of vaporization It is 3 or less times and is to a pan. It is 2 double less or equal. In addition, in case the difference of the above-mentioned latent heat of vaporization is satisfied, the more small thing of the latent heat of vaporization of a steamy cleaning agent is desirable. As the value of this latent heat of vaporization itself, 200 or less cal/g is desirable, and is 100 or less cal/g more preferably, and it is to a pan. They are 50 or less cal/g. In the system of this invention, especially the thing for which the above-mentioned ** and ** are satisfied is important.

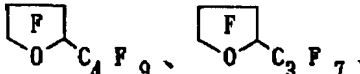
[0045] ** ***** -- the boiling point of a steamy cleaning agent needs to be higher than the temperature on the front face of a washed object at the time of steamy washing -- certain ** As a value of the desirable boiling point, it is a value higher 20 degrees C or more than the temperature on the front face of a washed object, is a more desirable value higher 30 degrees C or more than the temperature on the front face of a washed object, and is a still more desirable value high 50 degrees C or more. However, the difference of this boiling point and the temperature on the front face of a washed object can also be controlled by temperature on the

front face of a washed object. Namely, what is necessary is just to reduce the temperature on the front face of a washed object before a steamy washing process. A better condition is acquired by satisfying the conditions of this **.

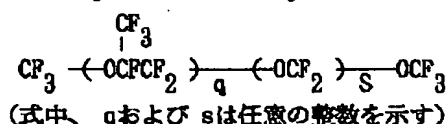
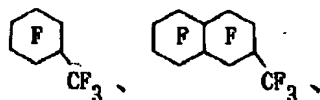
[0046] Here, in the rinse washing process in this invention, aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent and an isoparaffin system cleaning agent, are used. For an organic silicon system cleaning agent, SP value is abbreviation. 7 and the latent heat of vaporization are about 35 cal/g. It is extent. For an isoparaffin system cleaning agent, SP value is abbreviation. 6-8, and the latent heat of vaporization are about 50 to 90 cal/g extent. If these values are taken into consideration, IPA (SP value =11, latent-heat-of-vaporization =161 cal/g, the boiling point = 82 degrees C) which mentioned above will have satisfied all the conditions of the above-mentioned ** - **.

[0047] In addition, the conditions of ** are also satisfied more preferably that what is necessary is just what satisfies the conditions of the above-mentioned ** and ** fundamentally as a steamy cleaning agent mentioned above. It is possible to use it besides Above IPA, if such conditions are satisfied, for example, it is a general formula. : It is [Formula 8] to a perfluoro-compound which is expressed with $C_n F_{2n+2}$ (the inside of a formula and n show the integer of 4-12), and a pan.

構造式:



$(C_5 F_{11})_3 N$ 、 $(C_4 F_9)_3 N$ 、



It is also possible to use the perfluoro-compound expressed with **. SP value these perfluoro-compound Five to about 6 and the latent heat of vaporization It is 20 cal/g extent, and the boiling point has various kinds of things to 50 degrees C - about 200 degrees C, and all the conditions of the above-mentioned ** - ** are satisfied. What has the boiling point of 50 degrees C - about 150 degrees C in actual washing is desirable. In addition, since almost all organic solvents and compatibility were not shown, and particle was removed conventionally, it was not able to be used as a steamy cleaning agent of an except, but in this invention, since aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent and an isoparaffin system cleaning agent, are rinsed, it is used as a cleaning agent and these and compatibility are shown (the difference of SP value four or less), a perfluoro-compound can be used as a steamy cleaning agent.

[0048] Moreover, steamy cleaning agents mentioned above, such as IPA and a perfluoro-compound, must not be used by independent [its], and can also be used [aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above as such mixture, and an isoparaffin system cleaning agent, and] as a constituent which blended the organic solvent of others further, such as an acetone. In addition, neither a chlorofluocarbon system solvent nor a chlorine-based solvent is necessarily eliminated as an organic solvent to blend. Although it is better not to use this if it says from the point of environmental pollution, of course, it is useful as a process in the middle of the abolition. Thus, in case mixture is used as a steamy cleaning agent, it is desirable to satisfy the conditions of the above-mentioned ** and ** for SP value and the latent heat of vaporization of what are mixed. Each numeric value is the same as that of the value mentioned above. Moreover, it is effective to also make the organic solvent which has in-between SP value and the in-between latent heat of vaporization intervene.

[0049] Furthermore, carbon number of the organic silicon system cleaning agent mentioned above to the above-mentioned perfluoro-compound, an isoparaffin system cleaning agent, etc. The constituent which blended the aliphatic hydrocarbon system cleaning agent of 4-30 and organic solvents, such as IPA, ethanol, a methanol, an acetone, and dioxane, is a very useful 1 liquid type washing constituent which can be carried out from cleaning washing to desiccation with 1 liquid. As a compounding ratio of this 1 liquid type washing constituent, it is the above-mentioned perfluoro-compound. It is desirable to make an organic silicon system cleaning agent and/or an aliphatic hydrocarbon system cleaning agent into the 0.01 - 1000 weight section, and to make other organic solvents into the 0.01 - 1000 weight section to the 100 weight sections. These more desirable compounding ratios are each. It is the range of the 0.1 - 100 weight section. This 1 liquid type washing constituent shows a cleaning detergency and ridge nature, and by the same presentation, since steamy washing is also possible, it can perform them from cleaning washing to desiccation with 1 liquid.

[0050] In addition, although the above-mentioned washing station explained for ridge washing, it is also possible to use it for cleaning washing by changing the class of cleaning agent to be used.

[0051] According to the above-mentioned washing station, it is abbreviation by about 50-60-degree C warm air desiccation. It can dry in about 5 minutes. In addition, even if it makes it the elevated temperature of 120 degree C - 150 degrees C with the approach of performing warm air desiccation after the hot water rinsing by the conventional method, the drying time for about 15 minutes is required. And after warm air desiccation, since the temperature of a work piece is not high, the tooth space for work-piece cooling and cooldown delay after desiccation become unnecessary [that it can send to degree process as it is etc.], and improvement in large productivity is attained. Moreover, the drying time also of the ridge desiccation nonuniformity in the lot which carries out washing processing at once is lost, and it is not only short, but only improves sharply. [quality's] Furthermore, it becomes that there is also no defect by the crack initiation resulting from the washing nonuniformity of a washed object, and a quality level can be improved sharply.

[0052] moreover, in the washing station of the above-mentioned configuration, from using what has that as a cleaning agent [than fats-and-oils system dirt] [smaller / than water / the specific gravity and larger] The layer of a cleaning agent enters according to a specific gravity difference between a fats-and-oils layer and a water layer, it is avoided that a fats-and-oils layer and a water layer contact directly, it becomes possible [separating fats and oils and water completely], and it becomes possible to perform abandonment processing according to each efficiently. In addition, after oily water full separation, although an oil and water are removed from a cleaning agent, respectively, possibility that the cleaning agent of a minute amount will mix in underwater [which were removed / the fats and oils and underwater] remains. However, a problem is not produced for a cleaning agent to also burn easily and for the cleaning agent mixed into fats and oils incinerate it at the time of waste oil incineration. Moreover, about the cleaning agent mixed underwater, since a filter, a distillation machine, etc. separate with water easily, it does not become a problem.

[0053] And while being able to use a cleaning agent efficiently and effectively by using the washing station which has the above-mentioned configuration, use of two or more cleaning agents also becomes possible. This leads to reducing the amount of the cleaning agent used sharply, and contributes to sharp reduction of a running cost. Moreover, it is prevented that moisture mixes in Playback IPA by using the washing station of this invention as a last process of IPA steam seasoning, and since the difference of the boiling point of IPA and the above-mentioned ridge cleaning agent is large, steamy washing of only IPA is attained. In addition, since water and IPA have the near boiling point, it is difficult to remove moisture and it causes a watermark etc.

[0054] Next, other examples of this invention are explained. Drawing 2 is drawing showing the configuration of the washing station of other examples of this invention. The washing station shown in this drawing is divided roughly, and consists of the washing process D, a rinse washing

process E, a desiccation process F, and a cleaning agent playback device G. The 1st washing tub 21 and the 2nd washing tub 22, and the liquid end tub 23 are formed in the washing process D used as the 1st process. In addition, the number of tubs in a multi-tub connection tub of the washing tub in the washing process D etc. is [that what is necessary is just to choose from a single tub or a multi-tub connection tub according to washing time amount, washing quality, etc.] the same. moreover -- the 1st washing tub 21 and the 2nd washing tub 22 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together and the washing engine performance improves more by these. [0055] Cleaning cleaning agent D3 which added the hydrophilic solvent to the nonaqueous basic cleaning agent which becomes the above 1st and the 2nd washing tub 21 and 22 from aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above and an isoparaffin system cleaning agent, such mixture, etc. It holds, respectively. Cleaning agent D3 containing this hydrophilic solvent According to the washing capacity given with the hydrophilic solvent, the fats-and-oils system dirt carried in with the washed object X is dissolved into a cleaning agent D3. In addition, when just the 1st washing tub 21 of dissolution removal of the dirt adhering to a washed object X is insufficient, it may be made to wash by the 2nd washing tub 22 further.

[0056] Moreover, the cleaning agent D3 held in the 1st washing tub 21 and the 2nd washing tub 22 and the cleaning agent D3 carried into the liquid end tub 23 It is sent to the cleaning agent playback device G by drain piping 21a, 22a, and 23a connected to each tub. Moreover, filters 24 and 25 are connected to the 1st washing tub 21 and the 2nd washing tub 22, respectively, and it is a cleaning agent D3. After an inner solid-state object, a non-dissolved solid, etc. are removed, it flows back in each tub. although the above-mentioned filters 24 and 25 are variously chosen by the ingredient and the contents for washing -- for example -- 0.1-20 micrometers the microporous ceramic filter which has the pore size of extent, a glass filter, and the filter of an organic macromolecule system -- these multicomputer system filters etc. are used further preferably.

[0057] Moreover, the 3rd washing tub 26 and shower rinse tub 27 are prepared in the rinse washing process E used as the 2nd process. Cleaning agent D4 of only the nonaqueous basic cleaning agent used for the 3rd washing tub 26 at the process D of the above 1st It holds. Under the shower rinse tub 27, the buffer tank 28 is formed and these buffer tank 28 and the 3rd washing tub 26 are connected with the cleaning agent playback device G by drain piping 28a and 26a, respectively. this 3rd washing tub 26 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together. Cleaning agent D4 held in the 3rd washing tub 26 It always circulates through the filter 29 and is a cleaning agent D4 by this filter 29. An inner solid-state object, a non-dissolved solid, etc. are removed.

[0058] Furthermore, the steamy washing (desiccation) tub 30 is formed in the desiccation process F used as the 3rd process. In this steamy washing tub 30, liquids, such as such mixture, are held in the steamy cleaning agent 31, for example, IPA and the perfluoro-compound which were mentioned above, and the pan, and these are heated at a heater 32 and serve as a steam 33. Cleaning agent D4 carried in from the rinse washing process E into the steamy cleaning agent 31 which the steam 33 dewed and liquefied on the front face of a washed object X in such a steamy washing tub 30 It is melted and washed away. Furthermore, need time amount maintenance is carried out near the upside cooling chiller 34, a washed object X vaporizes the steamy cleaning agent 31 which carried out residual adhesion on a front face, and desiccation of a washed object X ends it.

[0059] In addition, about the device of the recovery and the reuse of the cleaning agent in the above-mentioned washing station, it is the same as that of the example mentioned above.

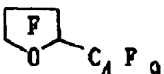
[0060] Next, the concrete example of washing using a washing station which was mentioned above, and its evaluation result are explained.

[0061] examples 1-7 -- the example of cleaning washing is described first. as the cleaning agent in the 1st washing process -- the mixture of the octamethylcyclotetrasiloxane (SP value = 7) 50 weight section and the diethylene-glycol monobutyl ether (SP value = 8) 50 weight section, and

the mixture of the volatile isoparaffin (SP value = 7) 50 weight section and the diethylene-glycol monobutyl ether 50 weight section -- moreover, it could set at the 2nd washing process and octamethylcyclotetrasiloxane was prepared as a rinse cleaning agent. Moreover, as a steamy cleaning agent, various kinds of things shown in Table 2 were prepared, respectively. In addition, formed SP value, the latent heat of vaporization, and the boiling point in the steamy cleaning agent (the example of a comparison is included) shown in Table 2 are as being shown in the following table 1. The steamy cleaning agent by the example is chosen in consideration of SP value and the latent heat of vaporization of octamethylcyclotetrasiloxane.

[0062]

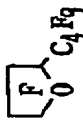
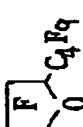


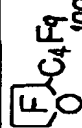
[Table 1]

	SP値	蒸発潜熱 (cal/g)	沸点 (°C)
C_8F_{18}	5	20	97
	6	20	102
I P A	11	161	82
オクタメチルシクロテトラシロキサン	7	36	175
ヘキサメチルジシロキサン	7	51	100
アセトン	10	62	56
エタノール	13	204	78

These cleaning agents were used and the printed circuit board using rosin system flux SUPAKURU flux PO-F -4600 (trade name, object for : chip mixed-loading substrates made from Senju Metal industry, and SP value = about 10) was washed. At the 1st washing process, it considers as 45 degrees C and ultrasonic cleaning during 3 minutes, and washing conditions are rinse washing. It considered as for 2 minutes. And the time amount which carried out steamy washing with each steamy cleaning agent, and desiccation took the printed circuit board after doing in this way and washing was measured. About the warm air desiccation by 50 degrees C, the drying time was measured similarly. Moreover, the amount of ion residue on the front face of a printed circuit board after desiccation (mug NaCl/inch²) was measured using omega meter (product made from Japanese Alpha Metals) based on MIL-P-55110C and MIL-P-28809A. Furthermore, the residue of flux was observed under the naked eye and the microscope, and the existence of dirt with a major axis of 0.05mm or more was checked. Moreover, practicality ability was judged synthetically, ** was given to O and a little sweet thing, and x was given to the poor thing at O and a good thing at the very good thing. These results are combined with the presentation ratio of each cleaning agent, and are shown in Table 2.

[0063]

[Table 2]

	洗浄組成物 (重量部)	リン系組成 (重量部)	蒸気洗浄組成物(重量部)					洗浄結果			
			IPA	その他 有機溶剤	オクタメチルシクロ テトラシロキサン	ヘキサメチル ジシロキサン	ペルフルオロ化合物	乾燥時間 (秒)	イオン残留 ($\mu\text{gNaCl}/\text{in}^2$)	外観 (白色残留)	実用性能 (総合判定)
実施例1	オクタメチルシクロ テトラシロキサン 50	オクタメチルシクロ テトラシロキサン 100	100	—	—	—	—	45	7	なし	◎
2	ジエチレングリコール モノエーテル 50		0.5	—	1.5	—		19	6	”	◎
3	揮発性インパライザー 50		—	アセトン	—	20	C ₈ F ₁₈	18	5	”	◎
4	ジエチレングリコール モノエーテル 50		—	アセトン	—	30		17	8	”	◎
5	50		—	—	—	—	C F	20	5	”	◎
6	オクタメチルシクロ テトラシロキサン50 ジエチレングリコール		—	—	—	—		19	4	”	◎
7	モノエーテル50		(50℃で乾燥)					125	6	”	○
比較例1	オクタメチルシクロ テトラシロキサン 50 ジエチレングリコール モノエーテル 50	IPA 100	—	—	—	—		58	18	乾燥シ、 多量	×
2	イタリール 100		—	—	—	—	”	20	45	あり	×

While cleaning detergency sufficient in the examples 1-7 is obtained so that clearly from the result of Table 2, the very good result is obtained also in steamy washing (desiccation). This is the difference of SP value of a rinse cleaning agent and a steamy cleaning agent. It is because it was referred to as 4-2. On the other hand, the difference of SP value In each of a certain example of a comparison, it turns out that a satisfactory detergency is not obtained five or more.

[0064] Examples 8-11, next the example of ridge washing are described. As a ridge cleaning agent, they are the mixture of the octamethylcyclotetrasiloxane 99.5 weight section and the polyoxyethylene oleyl ether (SP value = 8) 0.5 weight section and the volatile isoparaffin (SP value = 7) 99.0 weight section, and a sodium stearate. Mixture with the 1.0 weight sections was prepared. Moreover, as a steamy cleaning agent, various kinds of things shown in Table 3 were prepared, respectively.

[0065] These cleaning agents were used and ridge washing of a miniature bearing (product made from stainless steel) was performed. To the inside of the ridge cleaning agent of ordinary temperature after a washing trial and two miniature bearings are immersed in water Immersion (rocking to include) was carried out for 1 minute, and it carried out by subsequently performing steamy washing. Then, moved bearing into the dehydration ethanol of the specified quantity, residual moisture was made to absorb, and the quantum was carried out with the Karl Fischer technique. And the moisture elimination factor was computed from the following formulas.

[0066] Moisture elimination factor = $(B-A) / B \times 100$ (the value (g) and B which carried out the quantum of the A with the above-mentioned Karl Fischer technique among the formula are a quantum value (g) after a blank trial (except for an underwater injection process))

Moreover, the following criteria estimated the appearance after desiccation.

[0067] x: When desiccation JIMI is observed visually.

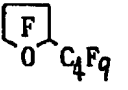
[0068] O : when desiccation JIMI is not observed visually.

[0069] O : it is 50 micrometers by the scanning electron microscope further. When the above silverfish is not observed.

[0070] The above measurement result is shown in Table 3.

[0071]

[Table 3]

	水切り組成物 (重量部)	蒸気洗浄組成物(重量部)					洗浄結果		
		IPA	その他 有機溶剤	オクタメチルシクロ テトラシロキサン	ヘキサメチル ジシロキサン	ペルフルオロ 化合物	洗浄後の 外観	水分除去率 %	実用性能 (総合判定)
実施例8	オクタメチルシクロ テトラシロキサン	100	—	—	—	—	◎	99.8	◎
“ 9	99.5 ジエチレングリコール モノブチルエーテル 0.5	0.5	—	2.0	—	C ₈ F ₁₈ 97.5	◎	99.3	◎
“ 10	揮発性イソパラフィン 99.0 ステアリン酸 ナトリウム 1.0	—	7ヘトン0.5	2.0	—	 97.5	◎	99.1	◎
“ 11		—	—	—	—	C ₈ F ₁₈ 100	◎	99.5	◎
比較例3	フロン113/ 界面活性剤系 100	—	—	フロン113/ 界面活性剤系 100	—	—	◎	99.1	◎



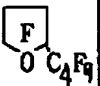
Even if it does not especially perform rinse washing according to each example so that clearly from the measurement result shown in Table 3, sufficient ridge nature is obtained.

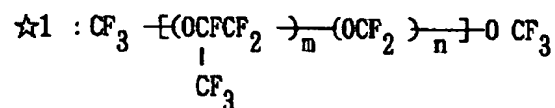
[0072] Examples 12–14, next the example of finishing washing (removal of particle) are described. Octamethylcyclotetrasiloxane and volatile isoparaffin were prepared as a finishing cleaning agent. Moreover, various kinds of things shown in Table 4 as a steamy cleaning agent were prepared, respectively. These cleaning agents were used and finishing washing of CCD cover glass was performed. The washing trial was carried out by performing desiccation finishing by steamy washing, after cleaning CCD cover glass ultrasonically in a 45-degree C finishing cleaning agent. And appearance evaluation after desiccation and measurement of a surface dust content were performed. The appearance after desiccation was evaluated like the above-mentioned example 8.

Moreover, the surface dust content (0.5 micrometers above) was measured using the particle checker and WM-1000 by the laser method (Tokyo Optical Co., Ltd. make). The above measurement result is shown in Table 4.

[0073]

[Table 4]

	洗浄組成物	洗浄組成物(重量部)					洗浄結果		
		IPA	その他 有機溶剤	オクタメチルシクロ テトラシロキサン	デカメチルシクロ ジシロキサン	ペルフルオロ 化合物	洗浄後の 外観	残留ダスト量 /0.5in ²	実用性能 (総合判定)
実施例12	オクタメチルシクロ テトラシロキサン	100	—	—	—	—	◎	15	◎
" 13	100	—	7セトン0.1	3	—	☆1 96.9	◎	12	◎
" 14	揮発性イソパラフィン 100	—	—	—	—	 100	◎	13	◎
比較例4	フロン113 100	—	フロン113 100	—	—	—	◎	20	◎
" 5	 100	—	—	—	—	 100	△ 研磨材 一部残留	150	△



It turns out that sufficient particle control has accomplished in each example so that clearly from the measurement result shown in Table 4.

[0074] As shown in 15 to example 20 table 5, various kinds of organic solvents were added to volatile isoparaffin, and the cleaning cleaning agent was prepared. Moreover, volatile isoparaffin was prepared as a rinse cleaning agent. Using these cleaning agents, the printed circuit board

with flux was washed like the example 1, and desiccation evaluation by 50-degree C warm air desiccation was performed like the example 1. moreover, spindle oil is applied on a steel plate -- the heating furnace of 150 degree C performed baking of 48 hours, and the test piece was produced. Washing (ultrasonic cleaning) of the fats and oils adhering to this test piece was performed using the above-mentioned cleaning cleaning agent, and the time amount which that washing took was measured. It is shown that a detergency is so high that a numeric value is small. Those results are shown in Table 5.

[0075]

[Table 5]

実施例	有機溶剤	揮発性 イソパラフィン	ケロシン	その他 炭化水素	フロン 113/ エタノール共溶系	乾燥時間 (秒)	イオン残渣 ($\mu\text{gNaCl}/\text{in}^2$)	外観 (白色基準)	油脂洗浄時間 (秒)
15	エチルアルコール 2	98	—	—	—	40	11	◎	92
16	ジエチレングリコール モノエチルエーテル 50	50	—	—	—	180	9	◎	60
17	d-リモネン 30 エチルアルコール 10	60	—	—	—	120	7	◎	45
18	a-ピネン 30 IPA 10	60	—	—	—	130	5	◎	40
19	—	—	100	—	—	820	40	×	150
20	ジエチレングリコール モノエチルエーテル 30	—	—	n-デカン 70	—	630	15	×	162
比較例 6	—	—	—	イソプロピル ベンゼン100	—	>2,000	42	×	166
7	エチルアルコール 2	—	—	ジアミルベン ゼン 98	—	>2,000	14	○	135
8	—	—	—	—	100	20	11	◎	60

When a rinse was carried out by volatile isoparaffin after the cleaning agent used as a principal component washed isoparaffin so that clearly from Table 5 (examples 15-18), it was able to dry by warm air in a short time. Moreover, ion residue was also low and white residue was not seen, either. Furthermore, the fats-and-oils backwashing rate was also quick, and chlorofluocarbon 113 / ethane azeotropy system, and the engine performance more than equivalent were shown in respect of the washing engine performance. Moreover, when washing and a rinse were performed using straight chain-like paraffin, such as kerosine and n-Deccan, (examples 19 and 20), drying [by warm air] was better than the example which used alkylbenzene. On the other hand, drying [according to warm air by the case (examples 7 and 8 of a comparison) where washing and a rinse are performed using alkylbenzenes, such as isopropylbenzene and JIAMIRU benzene] was bad, or desiccation in 30 minutes was impossible. For this reason, there was also much ion residue and many flux components (white residue) which remained without the ability washing were also seen.

[0076] Using an example 21 - 22 volatility isoparaffin as a finishing cleaning agent, finishing washing of CCD cover glass was performed like the example 12, and a washing property and drying characteristics were evaluated like the example 12. In addition, desiccation was considered as 50-degree C warm air desiccation. The result is shown in Table 6.

[0077]

[Table 6]

	ゴミ除去工程に用いた溶剤	洗浄後の外観	残渣ダスト量 (/0.5in ²)
実施例 21	揮発性イソパラフィン	◎	100
〃 22	n-デカン	○	350
比較例 9	イソプロピルベンゼン	30分でも乾燥せず ×	2,000
〃 10	ジアミルベンゼン	×	2,600
〃 11	フロン113/ エタノール共沸系	◎	90


In finishing washing using volatile isoparaffin or n-Deccan, there is also no desiccation JIMI after washing and it is also related with dust so that clearly from Table 6, and it is chlorofluocarbon 113. Equivalent detergency was shown. On the other hand, in each example of a comparison,

since drying was low, the dust content which many desiccation JIMI was seen and adhered during desiccation had also increased very much.

[0078] Using respectively the cleaning agent shown in 23 to example 28 table 7, a rinse cleaning agent, and a steamy cleaning agent, the printed circuit board with flux was washed like the example 1, and a washing property and drying characteristics were evaluated like the example 1. In addition, the conditions of cleaning washing and rinse washing were made into ultrasonic cleaning for 45 degrees C and 5 minutes. The result is shown in Table 7.

[0079]

[Table 7]

	洗浄工程 (組成 重量%)						洗浄工程	リンス工程	凝結浄工程	評価結果		
	揮発性/ソラフラフィン	有機溶剤	クロソソ	イソプロピルベンゼン	ジメチルベンゼン	n-デカン	70/30 113/エタノール 重量比			乾燥時間 (秒)	イオン残渣 ($\mu\text{gNaCl}/\text{in}^2$)	外観 (白点残渣)
実施例 23	98	エタノール 2	-	-	-	-	-	揮発性 イソパラフィン	C_8F_{18}	20	9	なし
" 24	96	エタノール 4	-	-	-	-	-	↑	C_6F_{14}	15	6	なし
" 25	70	ジエチルングリコール モノエーテル 30	-	-	-	-	-	↑	$\text{N}(\text{C}_4\text{F}_9)_3$	17	7	なし
" 26	30	ジエチルングリコール モノエーテル 70	-	-	-	-	-	↑	 C_4F_9	15	8	なし
" 27	-	50	50	-	-	-	-	クロソソ	IPA	60	21	なし
" 28	-	-	-	-	-	100	-	n-デカン	"	45	38	乾燥シ あり
比較例 12	-	70	-	30	-	-	-	イソプロピル ベンゼン	IPA	82	15	乾燥シ あり
" 13	-	20	-	-	80	-	-	ジメチル ベンゼン	"	98	31	乾燥シ あり
" 14	-	-	-	-	-	-	100	←	←	25	9	なし

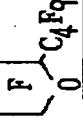
As a result of performing substrate washing using the cleaning agent and steamy cleaning agent which use isoparaffin as a principal component so that clearly from Table 7, it could dry in 15 seconds - 20 seconds, and there was also little ion residue and residual flux (white residue) was not seen, either. And chlorofluorocarbon 113/an ethanol azeotropy system, an EQC, or the engine performance beyond it was shown. Moreover, when substrate washing was performed using the cleaning agent and steamy cleaning agent which use kerosine and n-Deccan as a principal

component, effectiveness, such as drying characteristics better than the example of a comparison and compaction of the drying time, was acquired.

[0080] Using the ridge cleaning agent and steamy cleaning agent which are shown in 29 to example 32 table 8, ridge washing of a miniature bearing was performed like the example 8, and a washing property and drying characteristics were evaluated like the example 8. In addition, ridge washing is immersion rocking at 45 degrees C. It carried out for 1 minute. The result is shown in Table 8.

[0081]

[Table 8]

	洗浄工程(洗浄剤組成、重量部)							洗浄剤工程	評価結果	
	揮発性イソパラフィン	ポリオキシエチレン オレイルエーテル	ポリオキシエチレン ブチルフェニルエーテル	イソプロピル ベンゼン	シミル ベンゼン	n- デカン	フロン113/ 界面活性剤		外観	水分除去率 %
実施例 29	99.5	0.5	—	—	—	—	—	C ₆ F 14	◎	99.3
" 30	99.5	—	0.5	—	—	—	—	C ₈ F 18	◎	99.4
" 31	99.0	—	1.0	—	—	—	—	☆1	◎	99.6
" 32	—	—	0.5	—	—	99.5	—	C ₈ F 18	×	96
比較例 15	—	0.5	—	99.5	—	—	—	C ₆ F 14	×	91
" 16	—	1.0	—	—	99.0	—	—		×	89
" 17	—	—	—	—	—	—	100	←	◎	99.2

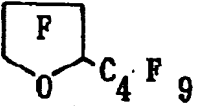
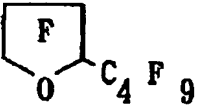
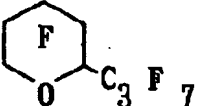
By the ridge using the ridge cleaning agent which uses volatile isoparaffin as a principal

component, it is satisfactory in the appearance after steam seasoning, and the moisture elimination factor also showed the value more than chlorofluorocarbon 113/a surfactant system, and an EQC so that clearly from Table 8. Moreover, when the ridge cleaning agent which uses n-Deccan as a principal component was used, the moisture elimination factor better than the example of a comparison was obtained. On the other hand, when alkylbenzene was used, moisture could not fully be removed but, for this reason, many moisture residuals and desiccation JIMI were seen.

[0082] Using the finishing cleaning agent and steamy cleaning agent which are shown in 33 to example 36 table 9, finishing washing of CCD cover glass was performed like the example 12, and a washing property and drying characteristics were evaluated like the example 12. The result is shown in Table 9.

[0083]

[Table 9]

	ゴミ除去工程	洗浄工程	外観	残留ダスト量 /in ²
実施例 33	揮発性イソパラフィン		◎	15
" 34	揮発性イソパラフィン	$[\text{CF}_3 \text{---} \underset{\text{CF}_3}{\text{C}}(\text{OCF}_2\text{CF}_2)_m \text{---} (\text{OCF}_2)_n] \text{OCF}_3$	◎	18
" 35	クロシン		○	220
" 36	n-デカン		○	180
比較例 18	イソプロピルベンゼン	$[\text{CF}_3 \text{---} \underset{\text{CF}}{\text{C}}(\text{OCF}_2\text{CF}_2)_m \text{---} (\text{OCF}_2)_n] \text{OCF}_3$	○	340
" 19	ジアミルベンゼン	C_6F_{14}	○	250
" 20	フロン113 (エタノール共溶媒)	←	◎	32

an example 37 -- as the cleaning agent in the 1st washing process -- the mixture of the hexa methyl disiloxane (SP value = 7) 50 weight section and the ethanol (SP value = 13) 50 weight section -- moreover, octamethylcyclotetrasiloxane was prepared as a rinse cleaning agent in the 2nd washing process. Moreover, C eight F18 was prepared as a steamy cleaning agent. When a washing property and drying characteristics were evaluated like the example 1 using these, the same good result as an example 1 was obtained.

[0084] SP value the cleaning agent in this example, i.e., hexa methyl disiloxane, and ethanol Although it is five or more, in order for the interaction of a polar group to show compatibility, a result which was described above is obtained.

[0085] As an example 38 perfluoro-compound To the C6 F 14 100 weight section, it is an

acetone as an organic silicon system cleaning agent considering hexa methyl disiloxane as 25 weight sections and an organic solvent. Three weight sections combination was carried out and the 1 liquid mold cleaner was prepared. on the other hand, the silicone system press oil YF33 (a trade name, Toshiba Silicone make) is applied to a steel plate -- what was able to be burned at 100 degree C was prepared as a test piece. And this test piece was washed using the top Norikazu liquid mold cleaner. For 40 degrees C and 3 minutes, washing conditions were made into ultrasonic cleaning and performed steamy washing with the same cleaning agent after this. [0086] Thus, when the washed steel plate front face was analyzed by ATIR, the peak equivalent to silicone did not appear but it checked that silicone residue did not exist.

[0087]

[Effect of the Invention] As explained above, while drying is acquired further, according to the washing approach of this invention, it is useful as an alternative cleaning method of the washing approach using the chlorofluocarbon system solvent which has various kinds of problems from the cleaning detergency which is equal to the chlorofluocarbon system currently used from the former, water replaceability, and there being neither environmental destruction nor worries about environmental pollution. Moreover, since it becomes possible to discard efficiently the water removed from the washed object, and the dirt matter while becoming reusable [a cleaning agent], even if it uses two or more cleaning agents, it contributes to saving-resources-ization of washing etc. greatly.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention is chlorofluocarbon 113. It is related with the washing approach and washing station using a chlorofluocarbon system solvent [like], a chlorine-based solvent, and the nonaqueous cleaning agent that replaces lower alcohol.

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PRIOR ART

[Description of the Prior Art] As the desiccation approach after rinsing of metal components, a plated part, paint components, electronic parts, semi-conductor components, etc., it is chlorofluocarbon 113. The approach using the chlorofluocarbon system solvent represented as a ridge cleaning agent is common. Moreover, organic solvents, such as the above-mentioned chlorofluocarbon system solvent, and trichloroethane, a trichloroethylene, tetrachloroethylene, a carbon tetrachloride, are broadly used also as a cleaning agent for removing oil dirt etc.

[0003] however, chlorofluocarbon 12 and chlorofluocarbon 113 with ozone modulus of rupture high since it has become clear for emission of chlorofluocarbon to lead to destruction of an ozone layer, and to have serious effect on the body or a living system recently etc. -- use is gradually reduced on a scale of being worldwide, and it is progressing in the direction abolished in the future. Moreover, chlorine-based organic solvents, such as a trichloroethylene and tetrachloroethylene, are also advancing in the direction in which use regulation is tightened up involving an environmental problem, such as causing contamination of soil, an underground water, etc. Although it is under such a situation, the chlorofluocarbon system matter with ozone modulus of rupture lower than the present chlorofluocarbon system solvent is being developed and industrial production is already advanced partly, it is not regarded as the desirable alternative cleaning agent from there not being no destruction of these and an ozone layer.

[0004] Then, the cleaning agent of a drainage system using a surfactant, a hydrophilic solvent, etc. which cause neither environmental destruction nor environmental pollution is beginning to be improved as a substitute of the cleaning agent by organic solvent system which was mentioned above. However, in such a cleaning agent, penetrating power is weak, for example, there is a problem that sufficient detergency can be demonstrated to the oil dirt with which hyperviscosity stuck neither from the dirt which invaded into components details, nor inside viscosity.

[0005] Moreover, although the cleaning agent using various surfactants as a substitute of the ridge cleaning agent by the organic solvent system etc. is examined, the present condition is that the ridge effectiveness which is equal to a chlorofluocarbon system solvent is not acquired. Moreover, when the organic solvent system cleaning agent mentioned above is used as a ridge cleaning agent, the specific gravity of a cleaning agent becomes large, water also surfaces on a cleaning agent not to mention fats and oils, and an oil and water are separated from a cleaning agent in the form where it contacted mutually. Thus, about the oil and water which touch mutually, it is difficult to take these out separately, and the problem has arisen from the abandonment approaches of an oil and each water differing in respect of waste fluid processing. Moreover, since the cleaning agent using a surfactant etc. has high compatibility with water, it is very difficult to carry out separation purification and to carry out the reuse of these cleaning agents.

[0006] On the other hand, the device in which various washing processes, such as soak cleaning, evaporation washing, and shower washing, are put in block in the washing station which used the conventional cleaning agent is adopted, and although raising washing effectiveness is also performed, it is the requisite to use the cleaning agent of a single class to the last. This will be because recovery and the reuse of a cleaning agent become difficult, if two or more cleaning

agents are used within a series of washing processes. This serves as a serious failure, when it is going to realize the cleaning effect which cannot be demonstrated, for example if independent by using two or more cleaning agents.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, while drying is acquired further, according to the washing approach of this invention, it is useful as an alternative cleaning method of the washing approach using the chlorofluocarbon system solvent which has various kinds of problems from the cleaning detergency which is equal to the chlorofluocarbon system currently used from the former, water replaceability, and there being neither environmental destruction nor worries about environmental pollution. Moreover, since it becomes possible to discard efficiently the water removed from the washed object, and the dirt matter while becoming reusable [a cleaning agent], even if it uses two or more cleaning agents, it contributes to saving-resources-ization of washing etc. greatly.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] As mentioned above, organic solvent system cleaning agents, such as a chlorofluocarbon system solvent, had the serious fault of causing environmental destruction, among the conventional cleaning agents containing a ridge cleaning agent. Moreover, the cleaning agent of the present condition currently examined as a substitute of these organic solvent system had the problem that sufficient effectiveness was not acquired. On the other hand, in the conventional washing approach or a washing station, there was a difficulty in respect of the removed abandonment of reuse of a cleaning agent, water, or the dirt matter. Furthermore, when it was going to reuse the cleaning agent efficiently, it had the difficulty that it becomes difficult to use two or more different cleaning agents.

[0008] This invention is made in order to cope with the technical problem which the conventional washing approach and a washing station which were mentioned above are holding, and it aims at offering the washing approach and washing station which are equal to washing which used the chlorofluocarbon system solvent etc. and with which detergency, water replaceability, drying, etc. are acquired. Moreover, in using two or more cleaning agents, other purposes of this invention are to offer the washing approach and washing station which enabled reuse of a cleaning agent. Furthermore, other purposes of this invention are to offer the washing approach and washing station which made it possible to discard efficiently the water removed from the washed object, and the dirt matter.

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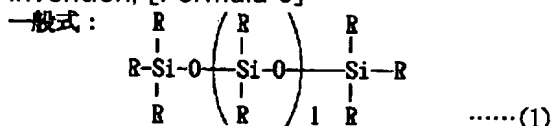
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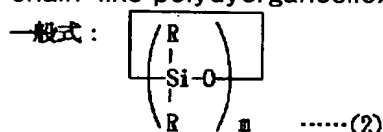
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OPERATION

[Means for Solving the Problem and its Function] Namely, the 1st washing approach in this invention, [Formula 5]



(-- the inside of a formula and R are the same -- or -- difference -- a hydrocarbon group a permutation or univalent [unsubstituted] and I show the integer of 0- 5 --) -- the straight chain-like polydyorganosiloxane expressed -- and [Formula 6]



the inside of a formula and R are the same -- or -- difference -- a permutation or a hydrocarbon group univalent [unsubstituted], and m -- the integer of 3- 7 being shown -- it is chosen out of the annular polydyorganosiloxane expressed -- at least -- With the organic silicon system cleaning agent which becomes substantial, from one sort of low-molecular-weight polyorganosiloxanes Carbon number With the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30 It is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0010] Moreover, the 2nd washing approach in this invention is a carbon number. It is the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic hydrocarbon system cleaning agent of 4-30, and is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0011] The 1st washing station in this invention was described above. (1) type Organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, Carbon number The 1st washing means which has a washing tub using the cleaning agent which added the washing engine-performance improver in the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, and washes a washed object by said washing tub to it, It has the washing tub which used said nonaqueous basic cleaning agent independently, and is characterized by providing the 2nd washing means which washes said washed object which passed through said 1st washing means by said washing tub.

[0012] Moreover, the 2nd washing station in this invention is a carbon number. It is a washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an

aliphatic hydrocarbon system cleaning agent of 4-30. It has a washing tub using the added cleaning agent, has the washing tub which used independently the 1st washing means and said nonaqueous basic cleaning agent which washes a washed object by said washing tub, and is characterized by providing the 2nd washing means which washes said washed object which passed through said 1st washing means by said washing tub.

[0013] As a cleaning agent used for the 1st washing process of this invention, a ridge cleaning agent which enables separation of moisture, for example, the cleaning cleaning agent used for removal of fats-and-oils dirt are illustrated. the nonaqueous basic cleaning agent used here was mentioned above -- as -- (1) type The organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, and carbon number Mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, or carbon number It is the aliphatic hydrocarbon system cleaning agent of 4-30. As a washing engine-performance improver, the surfactant which gives and raises the washing engine performance and the ridge engine performance, a hydrophilic solvent, etc. are illustrated by adding, for example to the above-mentioned nonaqueous basic cleaning agent. Moreover, fundamentally, the 2nd washing process of this invention business--does the above-mentioned nonaqueous basic cleaning agent too much, and turns into a washing process.

[0014] The above-mentioned low-molecular-weight polyorganosiloxane shows good replaceability with water, and has vaporization by warm air 60 degrees C or less, and drying while it has these outstanding penetrating power over the details of various washed objects, such as metal components, electronic parts, semi-conductor components, and paint components, and volatility and gives rust-proofing nature, even when it is independent. In addition, the above The polydyorganosiloxane which has the straight chain-like structure expressed with (1) type, and the above The polydyorganosiloxane which has the cyclic structure expressed with (2) types can also be used in common.

[0015] the above (1) type -- and -- Inside of (2) types R -- a permutation or unsubstituted a univalent hydrocarbon group -- it is -- for example, alkyl groups, such as a methyl group, an ethyl group, a propyl group, and butyl, a phenyl group, etc. A univalent unsubstituted hydrocarbon group, a univalent trifluoromethyl radical, etc. Although a univalent permutation hydrocarbon group etc. is illustrated, the stability of a system, volatile maintenance, etc. to a methyl group is the most desirable. As the above-mentioned low-molecular-weight polyorganosiloxane, what has cyclic structure is desirable, and octamethylcyclotetrasiloxane, decamethyl cyclopentasiloxane, and such mixture are still more suitable.

[0016] moreover, the thing for which the above-mentioned low-molecular-weight polyorganosiloxane chooses the molecular structure suitably -- the specific gravity Ddg of the cleaning agent -- the following the (A) type -- or -- The (B) type can be satisfied.

[0017] $Wdg > Ddg \dots$ (A) $Wdg > Ddg > Odg \dots$ (B) (Ddg shows the specific gravity of target fats-and-oils [specific gravity / of a nonaqueous basic cleaning agent / Wdg / specific gravity / of water / Odg] system dirt among a formula)

For example, By satisfying the (B) type, it becomes possible to separate water and fats-and-oils system dirt, and purification and waste fluid processing of a cleaning agent become easy.

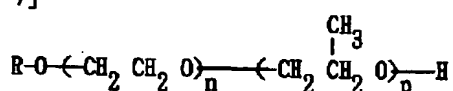
[0018] A carbon number the above-mentioned aliphatic hydrocarbon system cleaning agent It consists of aliphatic hydrocarbon (below, it is only described as an aliphatic hydrocarbon system cleaning agent) of the shape of the shape of branching of the range of 4-30, or a straight chain, for example, a carbon number The isoparaffin system cleaning agent of 4-30 is mentioned. as this isoparaffin system cleaning agent, what becomes substantial mentions from volatile isoparaffin -- having -- especially -- The isoparaffin which makes a subject the fraction of C4 - C15 is desirable from the point of the washing engine performance. an isoparaffin system cleaning agent -- the above-mentioned volatile isoparaffin one sort -- or -- It is used as two or more sorts of mixture. Such an aliphatic hydrocarbon system cleaning agent is harmless and no odor, and shows the same effectiveness as the above-mentioned organic silicon system cleaning agent while they have volatility.

[0019] You may use it independently, and it mixes with an organic silicon system cleaning agent, and the aliphatic hydrocarbon system cleaning agent hung up as the above-mentioned

nonaqueous basic cleaning agent can also be used as a nonaqueous basic cleaning agent. For example, if aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are blended with an organic silicon system cleaning agent, while the effectiveness of reducing the congealing point sharply will be acquired and making use in a cold district easy, improvement in the washing engine performance can also be aimed at.

[0020] A surfactant, a hydrophilic solvent, etc. are illustrated to have mentioned above as a washing engine-performance improver which carries out addition combination in a nonaqueous basic cleaning agent which was described above. Although a surface active agent is classified into a cation system, an anion system, the Nonion system, both-sexes systems, and these multicomputer systems according to the chemical structure which demonstrates activity, it is possible to use those all in this invention. Especially these surfactants are contributed to improvement in detergency. As what is preferably used in this invention among these surfactants, Cation system surfactants, such as amphoteric surface active agents, such as the Nonion system surfactants, such as anion system surfactants, such as a polyoxyalkylene alkyl ether sulfonate and phosphoric ester, polyhydric-alcohol fatty acid ester, polyoxyalkylene fatty acid ester, and polyoxyalkylene alkyl ether, and an imidazoline derivative, an alkylamine salt, and alkyl quarternary ammonium salt, etc. are illustrated, and although it is rare to exist in others by the single matter, a terpene system compound, higher-fatty-acid ester, etc. which are extracted from a natural product are mentioned. Moreover, it is also possible to use the synthetic compound which replaced a part of chemical structure of various compounds which were mentioned above by the fluorine atom or the silicon atom.

[0021] Moreover, what has compatibility to the above-mentioned nonaqueous basic cleaning agent as a hydrophilic solvent is used, and especially the flash point is suitable for a thing 40 degrees C or more practically. As such a hydrophilic solvent, polyhydric alcohol, such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, the ethylene glycol monopropyl ether, ethylene glycol monobutyl ether, ethylene-glycol-monobutyl-ether acetate, and the diethylene-glycol monobutyl ether, the derivative of those, etc. are illustrated, and especially the diethylene-glycol monobutyl ether is desirable from points, such as compatibility with a nonaqueous basic cleaning agent, and safety to the body. In order that volatility may improve under coexistence with low-molecular-weight polyorganosiloxane etc., the water displacement only in this combination article and desiccation are also possible for these compounds. Moreover, it is also possible to use lower alcohol, an acetone, etc. like ethyl alcohol depending on the class and application of a nonaqueous basic cleaning agent. Further, [Formula 7]



(-- the inside of a formula, and R -- carbon number [] -- the univalent hydrocarbon group of 1-12 is shown -- n and p are the integers of 0-10, respectively, and satisfy $n+p \geq 1$ --) -- in case aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are used for the polyoxyalkylene alkyl ether expressed as a nonaqueous basic cleaning agent, it is suitable.

[0022] The nonaqueous basic cleaning agent and washing engine-performance improver which were mentioned above shall be fundamentally used [the 1st washing process / the 2nd washing process] for a nonaqueous basic cleaning agent by the nonaqueous basic cleaning agent independent as a thing which added the washing engine-performance improver. A nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination according to an application, for example, in case it is used as a cleaning cleaning agent, what blended a surfactant, a hydrophilic solvent, or these both with the nonaqueous basic cleaning agent is suitable. A washing engine-performance improver which was described above to this can be blended and used, using the mixture of an organic silicon system cleaning agent and aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, as a nonaqueous basic cleaning agent. Moreover, although it is also possible to use it by the

nonaqueous basic cleaning agent independent in case it is used as a ridge cleaning agent, what added the surfactant and the hydrophilic solvent is desirable. Especially a hydrophilic solvent is suitable. In addition, what it is not necessary to make it not necessarily in agreement for example, and an organic silicon system cleaning agent is used at the 1st washing process, and uses an aliphatic hydrocarbon system cleaning agent at the 2nd washing process is possible for the nonaqueous basic cleaning agent in the 1st washing process, and the nonaqueous basic cleaning agent in the 2nd washing process.

[0023] Moreover, although a nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination which was mentioned above, mixing in consideration of each solubility is desirable. For example, the difference of a solubility factor (SP value is called hereafter) It is desirable to combine so that it may become four or less. Moreover, in case the difference of SP value mixes large liquid entirety, the liquid which has in-between SP value may be blended as a mixed medium.

[0024] Especially the compounding ratio of the surfactant mentioned above is a nonaqueous basic cleaning agent, in case it is used as a cleaning cleaning agent, although not limited. Below 50 weight sections are below 20 weight sections desirable still more preferably to the 100 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. Below 20 weight sections are to a pan to the 100 weight sections. They are below 3 weight sections. the time of on the other hand, using it as a cleaning cleaning agent, although especially the compounding ratio of a hydrophilic solvent is not limited, either -- nonaqueous basic cleaning agent the 100 weight sections -- receiving -- 50000 below the weight section -- desirable -- further -- desirable -- They are below the 10000 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. As opposed to the 100 weight sections Below the 100 weight sections are below 50 weight sections desirable still more preferably. In the washing approach of this invention, a washing process is completed by performing desiccation processing after a washing process which was mentioned above. As this desiccation down stream processing, effectiveness comparatively sufficient also by warm air desiccation at low temperature, such as 60 degrees C or less, is acquired. Moreover, it may replace with warm air desiccation and steam seasoning by steamy cleaning agents, such as isopropyl alcohol (it is hereafter described as IPA), may be performed. According to steam seasoning, desiccation finishing can be made more into fitness and it is suitable for precision washing etc. Moreover, as a washed object set as the object of this invention, it is a metal, the ceramics, plastics, etc. and they are still more specifically metal components, surface treatment components, electronic parts, semi-conductor components, an electrical part, a precision machinery component, an optic, glass components, ceramic components, etc.

[0025] Moreover, the washing station of this invention is characterized by providing the 1st washing means by the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent mentioned above, and the 2nd washing means by the above-mentioned nonaqueous basic cleaning agent. Moreover, desiccation means, such as warm air desiccation, are established after the 2nd washing means. And in spite of using two or more cleaning agents by establishing the means which carries out separation recovery only of the nonaqueous basic cleaning agent from the mixture of the nonaqueous basic cleaning agent collected from the above 1st and the 2nd washing means, and a washing engine-performance improver, it becomes possible to collect and reuse a cleaning agent efficiently. Moreover, the nonaqueous basic cleaning agent by which separation recovery was carried out is re-supplied to the 1st washing means or the 2nd washing means by the re-supply means. Furthermore, by establishing a means to remove the fats-and-oils system dirt by which floatation was carried out above a means to remove the moisture by which sedimentation was carried out under the cleaning agent, or a cleaning agent, it is efficient and water and fats-and-oils system dirt which were separated from the washed object can be discarded separately. In addition, it is possible for an immersion tub, a spray tub, etc. to be illustrated and to use together a supersonic wave, rocking, mechanical agitation, etc. as the above-mentioned washing means.

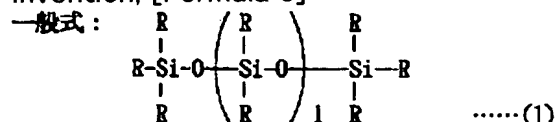
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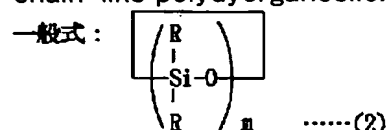
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OPERATION

[Means for Solving the Problem and its Function] Namely, the 1st washing approach in this invention, [Formula 5]



(-- the inside of a formula and R are the same -- or -- difference -- a hydrocarbon group a permutation or univalent [unsubstituted] and I show the integer of 0- 5 --) -- the straight chain-like polydyorganosiloxane expressed -- and [Formula 6]



the inside of a formula and R are the same -- or -- difference -- a permutation or a hydrocarbon group univalent [unsubstituted], and m -- the integer of 3- 7 being shown -- it is chosen out of the annular polydyorganosiloxane expressed -- at least -- With the organic silicon system cleaning agent which becomes substantial, from one sort of low-molecular-weight polyorganosiloxanes Carbon number With the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30 It is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0010] Moreover, the 2nd washing approach in this invention is a carbon number. It is the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an aliphatic hydrocarbon system cleaning agent of 4-30, and is characterized by having the 1st washing process which washes a washed object, and the 2nd washing process which washes said washed object which passed through said 1st washing process by said nonaqueous basic cleaning agent independent.

[0011] The 1st washing station in this invention was described above. (1) type Organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, Carbon number The 1st washing means which has a washing tub using the cleaning agent which added the washing engine-performance improver in the nonaqueous basic cleaning agent which consists of mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, and washes a washed object by said washing tub to it, It has the washing tub which used said nonaqueous basic cleaning agent independently, and is characterized by providing the 2nd washing means which washes said washed object which passed through said 1st washing means by said washing tub.

[0012] Moreover, the 2nd washing station in this invention is a carbon number. It is a washing engine-performance improver to the nonaqueous basic cleaning agent which consists of an

aliphatic hydrocarbon system cleaning agent of 4-30. It has a washing tub using the added cleaning agent, has the washing tub which used independently the 1st washing means and said nonaqueous basic cleaning agent which washes a washed object by said washing tub, and is characterized by providing the 2nd washing means which washes said washed object which passed through said 1st washing means by said washing tub.

[0013] As a cleaning agent used for the 1st washing process of this invention, a ridge cleaning agent which enables separation of moisture, for example, the cleaning cleaning agent used for removal of fats-and-oils dirt are illustrated. the nonaqueous basic cleaning agent used here was mentioned above -- as -- (1) type The organic silicon system cleaning agent which becomes substantial from the low-molecular-weight polyorganosiloxane expressed with (2) types, and carbon number Mixture with the aliphatic hydrocarbon system cleaning agent of 4-30, or carbon number It is the aliphatic hydrocarbon system cleaning agent of 4-30. As a washing engine-performance improver, the surfactant which gives and raises the washing engine performance and the ridge engine performance, a hydrophilic solvent, etc. are illustrated by adding, for example to the above-mentioned nonaqueous basic cleaning agent. Moreover, fundamentally, the 2nd washing process of this invention business--does the above-mentioned nonaqueous basic cleaning agent too much, and turns into a washing process.

[0014] The above-mentioned low-molecular-weight polyorganosiloxane shows good replaceability with water, and has vaporization by warm air 60 degrees C or less, and drying while it has these outstanding penetrating power over the details of various washed objects, such as metal components, electronic parts, semi-conductor components, and paint components, and volatility and gives rust-proofing nature, even when it is independent. In addition, the above The polydyorganosiloxane which has the straight chain-like structure expressed with (1) type, and the above The polydyorganosiloxane which has the cyclic structure expressed with (2) types can also be used in common.

[0015] the above (1) type -- and -- Inside of (2) types R -- a permutation or unsubstituted a univalent hydrocarbon group -- it is -- for example, alkyl groups, such as a methyl group, an ethyl group, a propyl group, and butyl, a phenyl group, etc. A univalent unsubstituted hydrocarbon group, a univalent trifluoromethyl radical, etc. Although a univalent permutation hydrocarbon group etc. is illustrated, the stability of a system, volatile maintenance, etc. to a methyl group is the most desirable. As the above-mentioned low-molecular-weight polyorganosiloxane, what has cyclic structure is desirable, and octamethylcyclotetrasiloxane, decamethyl cyclopentasiloxane, and such mixture are still more suitable.

[0016] moreover, the thing for which the above-mentioned low-molecular-weight polyorganosiloxane chooses the molecular structure suitably -- the specific gravity Ddg of the cleaning agent -- the following the (A) type -- or -- The (B) type can be satisfied.

[0017] $Wdg > Ddg$ (A) $Wdg > Ddg > Odg$.. (B) (Ddg shows the specific gravity of target fats-and-oils [specific gravity / of a nonaqueous basic cleaning agent / Wdg / specific gravity / of water / Odg] system dirt among a formula)

For example, By satisfying the (B) type, it becomes possible to separate water and fats-and-oils system dirt, and purification and waste fluid processing of a cleaning agent become easy.

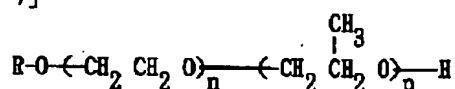
[0018] A carbon number the above-mentioned aliphatic hydrocarbon system cleaning agent It consists of aliphatic hydrocarbon (below, it is only described as an aliphatic hydrocarbon system cleaning agent) of the shape of the shape of branching of the range of 4-30, or a straight chain, for example, a carbon number The isoparaffin system cleaning agent of 4-30 is mentioned. as this isoparaffin system cleaning agent, what becomes substantial mentions from volatile isoparaffin -- having -- especially -- The isoparaffin which makes a subject the fraction of C4 - C15 is desirable from the point of the washing engine performance. an isoparaffin system cleaning agent -- the above-mentioned volatile isoparaffin one sort -- or -- It is used as two or more sorts of mixture. Such an aliphatic hydrocarbon system cleaning agent is harmlessness and no odor, and shows the same effectiveness as the above-mentioned organic silicon system cleaning agent while they have volatility.

[0019] You may use it independently, and it mixes with an organic silicon system cleaning agent, and the aliphatic hydrocarbon system cleaning agent hung up as the above-mentioned

nonaqueous basic cleaning agent can also be used as a nonaqueous basic cleaning agent. For example, if aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are blended with an organic silicon system cleaning agent, while the effectiveness of reducing the congealing point sharply will be acquired and making use in a cold district easy, improvement in the washing engine performance can also be aimed at.

[0020] A surfactant, a hydrophilic solvent, etc. are illustrated to have mentioned above as a washing engine-performance improver which carries out addition combination in a nonaqueous basic cleaning agent which was described above. Although a surface active agent is classified into a cation system, an anion system, the Nonion system, both-sexes systems, and these multicomputer systems according to the chemical structure which demonstrates activity, it is possible to use those all in this invention. Especially these surfactants are contributed to improvement in detergency. As what is preferably used in this invention among these surfactants, Cation system surfactants, such as amphoteric surface active agents, such as the Nonion system surfactants, such as anion system surfactants, such as a polyoxyalkylene alkyl ether sulfonate and phosphoric ester, polyhydric-alcohol fatty acid ester, polyoxyalkylene fatty acid ester, and polyoxyalkylene alkyl ether, and an imidazoline derivative, an alkylamine salt, and alkyl quarternary ammonium salt, etc. are illustrated, and although it is rare to exist in others by the single matter, a terpene system compound, higher-fatty-acid ester, etc. which are extracted from a natural product are mentioned. Moreover, it is also possible to use the synthetic compound which replaced a part of chemical structure of various compounds which were mentioned above by the fluorine atom or the silicon atom.

[0021] Moreover, what has compatibility to the above-mentioned nonaqueous basic cleaning agent as a hydrophilic solvent is used, and especially the flash point is suitable for a thing 40 degrees C or more practically. As such a hydrophilic solvent, polyhydric alcohol, such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, the ethylene glycol monopropyl ether, ethylene glycol monobutyl ether, ethylene-glycol-monobutyl-ether acetate, and the diethylene-glycol monobutyl ether, the derivative of those, etc. are illustrated, and especially the diethylene-glycol monobutyl ether is desirable from points, such as compatibility with a nonaqueous basic cleaning agent, and safety to the body. In order that volatility may improve under coexistence with low-molecular-weight polyorganosiloxane etc., the water displacement only in this combination article and desiccation are also possible for these compounds. Moreover, it is also possible to use lower alcohol, an acetone, etc. like ethyl alcohol depending on the class and application of a nonaqueous basic cleaning agent. Further, [Formula 7]



(-- the inside of a formula, and R -- carbon number [] -- the univalent hydrocarbon group of 1-12 is shown -- n and p are the integers of 0-10, respectively, and satisfy $n+p \geq 1$ --) -- in case aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, are used for the polyoxyalkylene alkyl ether expressed as a nonaqueous basic cleaning agent, it is suitable.

[0022] The nonaqueous basic cleaning agent and washing engine-performance improver which were mentioned above shall be fundamentally used [the 1st washing process / the 2nd washing process] for a nonaqueous basic cleaning agent by the nonaqueous basic cleaning agent independent as a thing which added the washing engine-performance improver. A nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination according to an application, for example, in case it is used as a cleaning cleaning agent, what blended a surfactant, a hydrophilic solvent, or these both with the nonaqueous basic cleaning agent is suitable. A washing engine-performance improver which was described above to this can be blended and used, using the mixture of an organic silicon system cleaning agent and aliphatic hydrocarbon system cleaning agents, such as an isoparaffin system cleaning agent, as a nonaqueous basic cleaning agent. Moreover, although it is also possible to use it by the

nonaqueous basic cleaning agent independent in case it is used as a ridge cleaning agent, what added the surfactant and the hydrophilic solvent is desirable. Especially a hydrophilic solvent is suitable. In addition, what it is not necessary to make it not necessarily in agreement for example, and an organic silicon system cleaning agent is used at the 1st washing process, and uses an aliphatic hydrocarbon system cleaning agent at the 2nd washing process is possible for the nonaqueous basic cleaning agent in the 1st washing process, and the nonaqueous basic cleaning agent in the 2nd washing process.

[0023] Moreover, although a nonaqueous basic cleaning agent and a washing engine-performance improver can be used with various kinds of combination which was mentioned above, mixing in consideration of each solubility is desirable. For example, the difference of a solubility factor (SP value is called hereafter) It is desirable to combine so that it may become four or less. Moreover, in case the difference of SP value mixes large liquid entirety, the liquid which has in-between SP value may be blended as a mixed medium.

[0024] Especially the compounding ratio of the surfactant mentioned above is a nonaqueous basic cleaning agent, in case it is used as a cleaning cleaning agent, although not limited. Below 50 weight sections are below 20 weight sections desirable still more preferably to the 100 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. Below 20 weight sections are to a pan to the 100 weight sections. They are below 3 weight sections. the time of on the other hand, using it as a cleaning cleaning agent, although especially the compounding ratio of a hydrophilic solvent is not limited, either -- nonaqueous basic cleaning agent the 100 weight sections -- receiving -- 50000 below the weight section -- desirable -- further -- desirable -- They are below the 10000 weight sections. Moreover, in case it is used as a ridge cleaning agent, it is a nonaqueous basic cleaning agent. As opposed to the 100 weight sections Below the 100 weight sections are below 50 weight sections desirable still more preferably. In the washing approach of this invention, a washing process is completed by performing desiccation processing after a washing process which was mentioned above. As this desiccation down stream processing, effectiveness comparatively sufficient also by warm air desiccation at low temperature, such as 60 degrees C or less, is acquired. Moreover, it may replace with warm air desiccation and steam seasoning by steamy cleaning agents, such as isopropyl alcohol (it is hereafter described as IPA), may be performed. According to steam seasoning, desiccation finishing can be made more into fitness and it is suitable for precision washing etc. Moreover, as a washed object set as the object of this invention, it is a metal, the ceramics, plastics, etc. and they are still more specifically metal components, surface treatment components, electronic parts, semi-conductor components, an electrical part, a precision machinery component, an optic, glass components, ceramic components, etc.

[0025] Moreover, the washing station of this invention is characterized by providing the 1st washing means by the cleaning agent which added the washing engine-performance improver to the nonaqueous basic cleaning agent mentioned above, and the 2nd washing means by the above-mentioned nonaqueous basic cleaning agent. Moreover, desiccation means, such as warm air desiccation, are established after the 2nd washing means. And in spite of using two or more cleaning agents by establishing the means which carries out separation recovery only of the nonaqueous basic cleaning agent from the mixture of the nonaqueous basic cleaning agent collected from the above 1st and the 2nd washing means, and a washing engine-performance improver, it becomes possible to collect and reuse a cleaning agent efficiently. Moreover, the nonaqueous basic cleaning agent by which separation recovery was carried out is re-supplied to the 1st washing means or the 2nd washing means by the re-supply means. Furthermore, by establishing a means to remove the fats-and-oils system dirt by which floatation was carried out above a means to remove the moisture by which sedimentation was carried out under the cleaning agent, or a cleaning agent, it is efficient and water and fats-and-oils system dirt which were separated from the washed object can be discarded separately. In addition, it is possible for an immersion tub, a spray tub, etc. to be illustrated and to use together a supersonic wave, rocking, mechanical agitation, etc. as the above-mentioned washing means.

[Translation done.]

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EXAMPLE

[Example] Hereafter, an example explains this invention to a detail more.

[0027] Drawing 1 is drawing showing the configuration of the washing station of one example of this invention. The washing station shown in this drawing is divided roughly, and consists of washing and a water displacement process A, a defecation / ridge process B, and a cleaning agent playback device C. The 1st washing tub 1, and the 2nd washing tub 2 and liquid end tub 3 having a sedimentation function and overflow isolation are prepared in washing and the water displacement process A used as the 1st process.

[0028] although the washing tub 1 of the above 1st and the 2nd washing tub 2 have a sedimentation function and overflow isolation and this has adhered to the washed object X -- a class -- choosing -- ****ing -- sedimentation functional independence and overflow isolation -- even when it is independent, depending on a washed object, it fully functions. Moreover, the number of tubs in a multi-tub connection tub of the washing tub in the 1st process etc. is [that what is necessary is just to choose from a single tub or a multi-tub connection tub according to washing time amount, washing quality, etc.] the same.

[0029] Also in this example, the multi-tub connection tub of two tubs is used, and it is connected by drain-piping 2a and overflow pipe 2b between the 1st washing tub 1 and the 2nd washing tub 2. moreover -- the 1st washing tub 1 and the 2nd washing tub -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together and the washing engine performance improves more by these.

[0030] Ridge cleaning agent D1 which added the surfactant to the nonaqueous basic cleaning agent which becomes the above 1st and the 2nd washing tub 1 and 2 from aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above and an isoparaffin system cleaning agent, such mixture, etc. It holds, respectively. Ridge cleaning agent D1 containing this surfactant That specific gravity is set up more greatly than fats-and-oils system dirt smaller than water. Therefore, the sedimentation of the water Y carried in with the washed object X is carried out under the cleaning agent D1 held in the 1st and 2nd washing tubs 1 and 2, respectively. Moreover, fats-and-oils system dirt Z is the cleaning agent D1 held in the 1st and 2nd washing tubs 1 and 2. Floation is carried out to the upper part, respectively.

[0031] The water Y by which sedimentation was carried out by the 2nd washing tub 2 is intermittently discharged by drain-piping 2a at the 1st washing tub 1 side. Moreover, the water Y by which sedimentation was carried out by the 1st washing tub 1 is discharged to the cleaning agent playback device C later mentioned intermittently by drain piping 4. Moreover, drain-piping 3a prepared in the liquid end tub 3 is also connected with the cleaning agent playback device C. Moreover, dirt Z of the fats-and-oils system by which floatation was carried out by the 1st washing tub 1 and the 2nd washing tub 2 carries out sequential overflow, and is discharged out of a system from the overflow pipe 5 formed in the 1st washing tub 1.

[0032] Ridge cleaning agent D1 held in the 1st washing tub 1 and the 2nd washing tub 2 It is sampled from the 1st washing tub 1 by piping 6a for circulation, and is a cleaning agent D1 by the filter 6. After an inner solid-state object, a water particle, a non-dissolved solid, etc. are removed, it flows back in the 2nd washing tub 2. By circulation through this filter 6, it is a cleaning agent D1. Cleaning agent D1 of the washing tub 2 which is always purified and serves as

the downstream on a washing process It is supposed that it is possible to maintain a purer condition.

[0033] For example, cleaning agent D1 Separation removal of the moisture currently mixed in inside as waterdrop is easily carried out with the above-mentioned filter 6. although the above-mentioned filter 6 is variously chosen by the ingredient and the contents for washing / ridge -- for example -- 0.1-20 micrometers the microporous ceramic filter which has the pore size of extent, a glass filter, and the filter of an organic macromolecule system -- these multicomputer system filters etc. are used further preferably.

[0034] Moreover, the 3rd washing tub 7 and shower rinse tub 8 are prepared in defecation / ridge process B used as the 2nd process. Under the shower rinse tub 8, the buffer tank 9 is formed and it is connected by drain-piping 9a and overflow pipe 9b between this buffer tank 9 and the 3rd washing tub 7. this 3rd washing tub 7 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together.

[0035] Cleaning agent D2 of only the nonaqueous basic cleaning agent used for the washing tub 7 of the above 3rd at the process A of the above 1st It holds. In addition, the concrete class of nonaqueous basic cleaning agent is made the same as that of the nonaqueous cleaning agent used at the process A of the above 1st. This cleaning agent D2 That specific gravity is set up more greatly than the dirt of a fats-and-oils system smaller than water. Therefore, Water Y is a cleaning agent D2 like the washing tub in the 1st process A. Sedimentation is carried out to a lower part, and dirt Z of a fats-and-oils system is a cleaning agent D2. Floatation is carried out to the upper part. The water Y by which sedimentation was carried out by the 3rd washing tub 7 is intermittently discharged by drain piping 10 to the cleaning agent playback device C. Moreover, dirt Z of the fats-and-oils system by which floatation was carried out by the 3rd washing tub 7 is discharged out of a system from an overflow pipe 11.

[0036] Moreover, cleaning agent D2 held in the 3rd washing tub 7 It always circulates through the filter 12 and is a cleaning agent D2 by this filter 12. An inner solid-state object, a water particle, a non-dissolved solid, etc. are removed.

[0037] Next, recovery and the reuse of the cleaning agent in the above-mentioned washing station are explained.

[0038] As mentioned above, each drain piping 4, 3a, and 10 prepared in the 1st, 2nd, and 3rd washing tubs 1, 2, and 7 and liquid end tub 3 is connected to the cleaning agent playback device C. Cleaning agent D1 held in each washing tub Or D2 Although always purified by filters 6 and 12, when the dirt of a cleaning agent becomes severe, it is sent to the cleaning agent playback device C by each drain piping 4 and 10 with a conveying pump 13, and fractional distillation purification is carried out. Moreover, cleaning agent D1 collected on the liquid end tub 3 It is intermittently sent to the cleaning agent playback device C. By the cleaning agent playback device C, separation with a liquid and a solid-state is first performed by the filter 14, a part for a solid-state is discarded and only a liquid is sent to a distiller 15. In this distiller 15, separation is performed using the difference of the boiling points, such as each component in a cleaning agent, water, and fats-and-oils system dirt. Moreover, the moisture which remained with the distiller 15 is further separated by the decanter 16. In addition, before introducing into a distiller 15, separation removal of moisture may be beforehand performed by a coalescer etc. It sets here to the cleaning agent currently used with the above-mentioned washing station, and is the ridge cleaning agent D1. Cleaning agent D2 of only a nonaqueous basic cleaning agent In order to add a surfactant, it is a cleaning agent D1. And cleaning agent D2 The separation extract of the nonaqueous basic cleaning agent D2, i.e., the cleaning agent, can be carried out from each, and it is a cleaning agent D2. It is reproduced. Moreover, this reproduced cleaning agent D2 The component of an except, i.e., a surfactant, moisture, etc., is discarded. This reproduced cleaning agent D2 It is a cleaning agent D1 by piping 17 to the shower rinse tub 8, the 3rd washing tub 7, or the 2nd washing tub 2. It is sent to the combination machine 18 to supply.

[0039] At the shower rinse tub 8, it is the above-mentioned playback cleaning agent D2. Or new cleaning agent D2 sent from the cleaning agent charging line 19 Cleaning agent D2 which does not contain an impurity Shower washing is performed. Moreover, with the combination machine

18, they are playback or the new cleaning agent D2. The new surfactant sent from the surfactant charging line 20 or the cleaning agent with which the surfactant was blended thickly in advance is mixed, and it is newly a cleaning agent D1. It is prepared. This cleaning agent D1 The 2nd washing tub 2 is supplied if needed.

[0040] The washing process in the washing station which has the above-mentioned configuration is as being shown below. When moisture Y and fats-and-oils system dirt Z have adhered to the washed object X, it is first immersed in the 1st washing tub 1 of the 1st process A, and the 2nd washing tub 2 in order, and the permutation of the removal, and moisture Y and a ridge cleaning agent of fats-and-oils system dirt Z is performed. Then, cleaning agent D1 which has adhered to the washed object X front face on the liquid end tub 3 It is removed.

[0041] Next, cleaning agent D2 which does not contain an impurity by the shower rinse tub 8 after a ridge is performed, while the surfactant which is sent to the 2nd process B and remains on the washed object X front face by the 3rd washing tub 7 was removed Shower washing is performed and final surface purification and a surface final ridge are performed.

[0042] Then, desiccation processing is performed with the warm air oven which omitted illustration, and a washing process is completed. Moreover, it may replace with this warm air desiccation, and steam seasoning (washing) by IPA etc. may be performed.

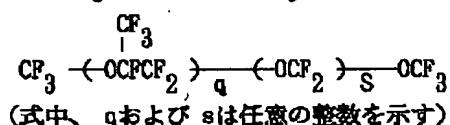
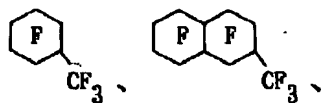
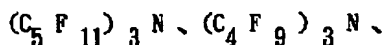
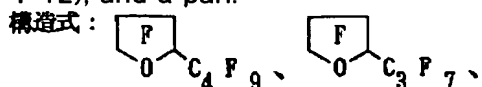
[0043] By the way, this invention persons are ***** to especially the following point being effective in this system, when performing steamy washing (desiccation). That is, they are the difference of the latent heat of vaporization of the latent heat of vaporization of the compatibility of ** steamy cleaning agent and the liquid carried in from a last process, and ** steamy cleaning agent and a steamy cleaning agent, and the liquid carried in from a last process, and the point that ** boiling point must be taken into consideration. Although the hydrogen bond of molecules and the interaction of a polar group may have to be further taken into consideration about the above-mentioned **, the difference of SP value with the liquid carried in from a last process It turned out that it becomes an effective factor especially to use four or less steamy cleaning agent. As for this, the difference of SP value with the liquid which is because it is carried out by melting the liquid adhering to a washed object and washing away, and is carried in from a steamy cleaning agent and a last process into the steamy cleaning agent which dewed on the washed object front face steamy washing If 4 is exceeded, sufficient replaceability will no longer be acquired. Difference of more desirable SP value It is three or less and is to a pan. It is two or less.

[0044] Moreover, about **, the difference of the latent heat of vaporization with the liquid carried in from a last process It is desirable to use a 5 or less-time steamy cleaning agent. That is, the difference of the latent heat of vaporization If 5 times are exceeded, since vapor rates differ greatly, the large liquid of the latent heat of vaporization will remain on a washed object, and possibility of remaining as silverfish etc. will become large. Difference of the more desirable latent heat of vaporization It is 3 or less times and is to a pan. It is 2 double less or equal. In addition, in case the difference of the above-mentioned latent heat of vaporization is satisfied, the more small thing of the latent heat of vaporization of a steamy cleaning agent is desirable. As the value of this latent heat of vaporization itself, 200 or less cal/g is desirable, and is 100 or less cal/g more preferably, and it is to a pan. They are 50 or less cal/g. In the system of this invention, especially the thing for which the above-mentioned ** and ** are satisfied is important.

[0045] ** ***** -- the boiling point of a steamy cleaning agent needs to be higher than the temperature on the front face of a washed object at the time of steamy washing -- certain ** As a value of the desirable boiling point, it is a value higher 20 degrees C or more than the temperature on the front face of a washed object, is a more desirable value higher 30 degrees C or more than the temperature on the front face of a washed object, and is a still more desirable value high 50 degrees C or more. However, the difference of this boiling point and the temperature on the front face of a washed object can also be controlled by temperature on the front face of a washed object. Namely, what is necessary is just to reduce the temperature on the front face of a washed object before a steamy washing process. A better condition is acquired by satisfying the conditions of this **.

[0046] Here, in the rinse washing process in this invention, aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent and an isoparaffin system cleaning agent, are used. For an organic silicon system cleaning agent, SP value is abbreviation. 7 and the latent heat of vaporization are about 35 cal/g. It is extent. For an isoparaffin system cleaning agent, SP value is abbreviation. 6-8, and the latent heat of vaporization are about 50 to 90 cal/g extent. If these values are taken into consideration, IPA (SP value =11, latent-heat-of-vaporization =161 cal/g, the boiling point = 82 degrees C) which mentioned above will have satisfied all the conditions of the above-mentioned ** - **.

[0047] In addition, the conditions of ** are also satisfied more preferably that what is necessary is just what satisfies the conditions of the above-mentioned ** and ** fundamentally as a steamy cleaning agent mentioned above. It is possible to use it besides Above IPA, if such conditions are satisfied, for example, it is a general formula. : It is [Formula 8] to a perfluoro-compound which is expressed with $C_n F_{2n+2}$ (the inside of a formula and n show the integer of 4-12), and a pan.



It is also possible to use the perfluoro-compound expressed with **. SP value these perfluoro-compound Five to about 6 and the latent heat of vaporization It is 20 cal/g extent, and the boiling point has various kinds of things to 50 degrees C - about 200 degrees C, and all the conditions of the above-mentioned ** - ** are satisfied. What has the boiling point of 50 degrees C - about 150 degrees C in actual washing is desirable. In addition, since almost all organic solvents and compatibility were not shown, and particle was removed conventionally, it was not able to be used as a steamy cleaning agent of an except, but in this invention, since aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent and an isoparaffin system cleaning agent, are rinsed, it is used as a cleaning agent and these and compatibility are shown (the difference of SP value four or less), a perfluoro-compound can be used as a steamy cleaning agent.

[0048] Moreover, steamy cleaning agents mentioned above, such as IPA and a perfluoro-compound, must not be used by independent [its], and can also be used [aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above as such mixture, and an isoparaffin system cleaning agent, and] as a constituent which blended the organic solvent of others further, such as an acetone. In addition, neither a chlorofluocarbon system solvent nor a chlorine-based solvent is necessarily eliminated as an organic solvent to blend. Although it is better not to use this if it says from the point of environmental pollution, of course, it is useful as a process in the middle of the abolition. Thus, in case mixture is used as a steamy cleaning agent, it is desirable to satisfy the conditions of the above-mentioned ** and ** for SP value and the latent heat of vaporization of what are mixed. Each numeric value is the same as that of the value mentioned above. Moreover, it is effective to also make the organic solvent which has in-between SP value and the in-between latent heat of vaporization intervene.

[0049] Furthermore, carbon number of the organic silicon system cleaning agent mentioned above to the above-mentioned perfluoro-compound, an isoparaffin system cleaning agent, etc.

The constituent which blended the aliphatic hydrocarbon system cleaning agent of 4-30 and organic solvents, such as IPA, ethanol, a methanol, an acetone, and dioxane, is a very useful 1 liquid type washing constituent which can be carried out from cleaning washing to desiccation with 1 liquid. As a compounding ratio of this 1 liquid type washing constituent, it is the above-mentioned perfluoro-compound. It is desirable to make an organic silicon system cleaning agent and/or an aliphatic hydrocarbon system cleaning agent into the 0.01 - 1000 weight section, and to make other organic solvents into the 0.01 - 1000 weight section to the 100 weight sections. These more desirable compounding ratios are each. It is the range of the 0.1 - 100 weight section. This 1 liquid type washing constituent shows a cleaning detergency and ridge nature, and by the same presentation, since steamy washing is also possible, it can perform them from cleaning washing to desiccation with 1 liquid.

[0050] In addition, although the above-mentioned washing station explained for ridge washing, it is also possible to use it for cleaning washing by changing the class of cleaning agent to be used.

[0051] According to the above-mentioned washing station, it is abbreviation by about 50-60-degree C warm air desiccation. It can dry in about 5 minutes. In addition, even if it makes it the elevated temperature of 120 degree C - 150 degrees C with the approach of performing warm air desiccation after the hot water rinsing by the conventional method, the drying time for about 15 minutes is required. And after warm air desiccation, since the temperature of a work piece is not high, the tooth space for work-piece cooling and cooldown delay after desiccation become unnecessary [that it can send to degree process as it is etc.], and improvement in large productivity is attained. Moreover, the drying time also of the ridge desiccation nonuniformity in the lot which carries out washing processing at once is lost, and it is not only short, but only improves sharply. [quality's] Furthermore, it becomes that there is also no defect by the crack initiation resulting from the washing nonuniformity of a washed object, and a quality level can be improved sharply.

[0052] moreover, in the washing station of the above-mentioned configuration, from using what has that as a cleaning agent [than fats-and-oils system dirt] [smaller / than water / the specific gravity and larger] The layer of a cleaning agent enters according to a specific gravity difference between a fats-and-oils layer and a water layer, it is avoided that a fats-and-oils layer and a water layer contact directly, it becomes possible [separating fats and oils and water completely], and it becomes possible to perform abandonment processing according to each efficiently. In addition, after oily water full separation, although an oil and water are removed from a cleaning agent, respectively, possibility that the cleaning agent of a minute amount will mix in underwater [which were removed / the fats and oils and underwater] remains. However, a problem is not produced for a cleaning agent to also burn easily and for the cleaning agent mixed into fats and oils incinerate it at the time of waste oil incineration. Moreover, about the cleaning agent mixed underwater, since a filter, a distillation machine, etc. separate with water easily, it does not become a problem.

[0053] And while being able to use a cleaning agent efficiently and effectively by using the washing station which has the above-mentioned configuration, use of two or more cleaning agents also becomes possible. This leads to reducing the amount of the cleaning agent used sharply, and contributes to sharp reduction of a running cost. Moreover, it is prevented that moisture mixes in Playback IPA by using the washing station of this invention as a last process of IPA steam seasoning, and since the difference of the boiling point of IPA and the above-mentioned ridge cleaning agent is large, steamy washing of only IPA is attained. In addition, since water and IPA have the near boiling point, it is difficult to remove moisture and it causes a watermark etc.

[0054] Next, other examples of this invention are explained. Drawing 2 is drawing showing the configuration of the washing station of other examples of this invention. The washing station shown in this drawing is divided roughly, and consists of the washing process D, a rinse washing process E, a desiccation process F, and a cleaning agent playback device G. The 1st washing tub 21 and the 2nd washing tub 22, and the liquid end tub 23 are formed in the washing process D used as the 1st process. In addition, the number of tubs in a multi-tub connection tub of the

washing tub in the washing process D etc. is [that what is necessary is just to choose from a single tub or a multi-tub connection tub according to washing time amount, washing quality, etc.] the same. moreover -- the 1st washing tub 21 and the 2nd washing tub 22 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together and the washing engine performance improves more by these. [0055] Cleaning cleaning agent D3 which added the hydrophilic solvent to the nonaqueous basic cleaning agent which becomes the above 1st and the 2nd washing tub 21 and 22 from aliphatic hydrocarbon system cleaning agents, such as an organic silicon system cleaning agent mentioned above and an isoparaffin system cleaning agent, such mixture, etc. It holds, respectively. Cleaning agent D3 containing this hydrophilic solvent According to the washing capacity given with the hydrophilic solvent, the fats-and-oils system dirt carried in with the washed object X is dissolved into a cleaning agent D3. In addition, when just the 1st washing tub 21 of dissolution removal of the dirt adhering to a washed object X is insufficient, it may be made to wash by the 2nd washing tub 22 further.

[0056] Moreover, the cleaning agent D3 held in the 1st washing tub 21 and the 2nd washing tub 22 and the cleaning agent D3 carried into the liquid end tub 23 It is sent to the cleaning agent playback device G by drain piping 21a, 22a, and 23a connected to each tub. Moreover, filters 24 and 25 are connected to the 1st washing tub 21 and the 2nd washing tub 22, respectively, and it is a cleaning agent D3. After an inner solid-state object, a non-dissolved solid, etc. are removed, it flows back in each tub. although the above-mentioned filters 24 and 25 are variously chosen by the ingredient and the contents for washing -- for example -- 0.1-20 micrometers the microporous ceramic filter which has the pore size of extent, a glass filter, and the filter of an organic macromolecule system -- these multicomputer system filters etc. are used further preferably.

[0057] Moreover, the 3rd washing tub 26 and shower rinse tub 27 are prepared in the rinse washing process E used as the 2nd process. Cleaning agent D4 of only the nonaqueous basic cleaning agent used for the 3rd washing tub 26 at the process D of the above 1st It holds. Under the shower rinse tub 27, the buffer tank 28 is formed and these buffer tank 28 and the 3rd washing tub 26 are connected with the cleaning agent playback device G by drain piping 28a and 26a, respectively. this 3rd washing tub 26 -- the need -- responding -- a supersonic wave, rocking, mechanical agitation, and a cleaning agent -- warming, brushing, etc. are used together. Cleaning agent D4 held in the 3rd washing tub 26 It always circulates through the filter 29 and is a cleaning agent D4 by this filter 29. An inner solid-state object, a non-dissolved solid, etc. are removed.

[0058] Furthermore, the steamy washing (desiccation) tub 30 is formed in the desiccation process F used as the 3rd process. In this steamy washing tub 30, liquids, such as such mixture, are held in the steamy cleaning agent 31, for example, IPA and the perfluoro-compound which were mentioned above, and the pan, and these are heated at a heater 32 and serve as a steam 33. Cleaning agent D4 carried in from the rinse washing process E into the steamy cleaning agent 31 which the steam 33 dewed and liquefied on the front face of a washed object X in such a steamy washing tub 30 It is melted and washed away. Furthermore, need time amount maintenance is carried out near the upside cooling chiller 34, a washed object X vaporizes the steamy cleaning agent 31 which carried out residual adhesion on a-front face, and desiccation of a washed object X ends it.

[0059] In addition, about the device of the recovery and the reuse of the cleaning agent in the above-mentioned washing station, it is the same as that of the example mentioned above.

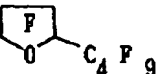
[0060] Next, the concrete example of washing using a washing station which was mentioned above, and its evaluation result are explained.

[0061] examples 1-7 -- the example of cleaning washing is described first. as the cleaning agent in the 1st washing process -- the mixture of the octamethylcyclotetrasiloxane (SP value = 7) 50 weight section and the diethylene-glycol monobutyl ether (SP value = 8) 50 weight section, and the mixture of the volatile isoparaffin (SP value = 7) 50 weight section and the diethylene-glycol monobutyl ether 50 weight section -- moreover, it could set at the 2nd washing process and octamethylcyclotetrasiloxane was prepared as a rinse cleaning agent. Moreover, as a steamy

cleaning agent, various kinds of things shown in Table 2 were prepared, respectively. In addition, formed SP value, the latent heat of vaporization, and the boiling point in the steamy cleaning agent (the example of a comparison is included) shown in Table 2 are as being shown in the following table 1. The steamy cleaning agent by the example is chosen in consideration of SP value and the latent heat of vaporization of octamethylcyclotetrasiloxane.

[0062]





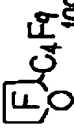
[Table 1]

	SP値	蒸発潜熱 (cal/g)	沸点 (℃)
C_8F_{18}	5	20	97
	6	20	102
I P A	11	161	82
オクタメチルシクロテトラシロキサン	7	36	175
ヘキサメチルジシロキサン	7	51	100
アセトン	10	62	56
エタノール	13	204	78

These cleaning agents were used and the printed circuit board using rosin system flux SUPAKURU flux PO-F -4600 (trade name, object for : chip mixed-loading substrates made from Senju Metal industry, and SP value = about 10) was washed. At the 1st washing process, it considers as 45 degrees C and ultrasonic cleaning during 3 minutes, and washing conditions are rinse washing. It considered as for 2 minutes. And the time amount which carried out steamy washing with each steamy cleaning agent, and desiccation took the printed circuit board after doing in this way and washing was measured. About the warm air desiccation by 50 degrees C, the drying time was measured similarly. Moreover, the amount of ion residue on the front face of a printed circuit board after desiccation (mug NaCl/inch²) was measured using omega meter (product made from Japanese Alpha Metals) based on MIL-P-55110C and MIL-P-28809A. Furthermore, the residue of flux was observed under the naked eye and the microscope, and the existence of dirt with a major axis of 0.05mm or more was checked. Moreover, practicality ability was judged synthetically, ** was given to O and a little sweet thing, and x was given to the poor thing at O and a good thing at the very good thing. These results are combined with the presentation ratio of each cleaning agent, and are shown in Table 2.

[0063]

[Table 2]

	洗浄組成物 (重量部)	リン系組成物 (重量部)	蒸気洗淨組成物(重量部)						洗浄結果				
			IPA	その他有機溶剤	オクタメチルシクロテトラシロキサン	ヘキサメチルジシロキサン	ペルフルオロ化合物	乾燥時間(秒)	イオン残量($\mu\text{gNaCl}/\text{in}^2$)	外観(白色残量)	実用性能(総合判定)		
実施例1	オクタメチルシクロテトラシロキサン50	オクタメチルシクロテトラシロキサン100	100	—	—	—	—	—	45	7	なし	◎	
・ 2	ジエチレンジグリコールモノプロピルエーテル50		0.5	—	1.5	—	—		19	6	"	◎	
・ 3	揮発性インパライン50		—	アセトン	—	20	C ₈ F ₁₈	79	18	5	"	◎	
・ 4	ジエチレンジグリコールモノプロピルエーテル50		—	アセトン	—	30		67	17	8	"	◎	
・ 5	50		—	—	—	—	C F	100	20	5	"	◎	
・ 6	オクタメチルシクロテトラシロキサン50		—	—	—	—	—		100	19	4	"	◎
・ 7	ジエチレンジグリコールモノプロピルエーテル50		(50℃で乾燥)						125	6	"	○	
比較例1	オクタメチルシクロテトラシロキサン50	IPA100	—	—	—	—	—		58	18	乾燥シ多量	×	
・ 2	イタリール100		—	—	—	—	—	"	20	45	あり	×	

While cleaning detergency sufficient in the examples 1-7 is obtained so that clearly from the result of Table 2, the very good result is obtained also in steamy washing (desiccation). This is the difference of SP value of a rinse cleaning agent and a steamy cleaning agent. It is because it was referred to as 4-2. On the other hand, the difference of SP value In each of a certain example of a comparison, it turns out that a satisfactory detergency is not obtained five or more.

[0064] Examples 8-11, next the example of ridge washing are described. As a ridge cleaning agent, they are the mixture of the octamethylcyclotetrasiloxane 99.5 weight section and the polyoxyethylene oleyl ether (SP value = 8) 0.5 weight section and the volatile isoparaffin (SP value = 7) 99.0 weight section, and a sodium stearate. Mixture with the 1.0 weight sections was prepared. Moreover, as a steamy cleaning agent, various kinds of things shown in Table 3 were prepared, respectively.

[0065] These cleaning agents were used and ridge washing of a miniature bearing (product made from stainless steel) was performed. To the inside of the ridge cleaning agent of ordinary temperature after a washing trial and two miniature bearings are immersed in water Immersion (rocking to include) was carried out for 1 minute, and it carried out by subsequently performing steamy washing. Then, moved bearing into the dehydration ethanol of the specified quantity, residual moisture was made to absorb, and the quantum was carried out with the Karl Fischer technique. And the moisture elimination factor was computed from the following formulas.

[0066] Moisture elimination factor = $(B-A) / B \times 100$ (the value (g) and B which carried out the quantum of the A with the above-mentioned Karl Fischer technique among the formula are a quantum value (g) after a blank trial (except for an underwater injection process))

Moreover, the following criteria estimated the appearance after desiccation.

[0067] x: When desiccation JIMI is observed visually.

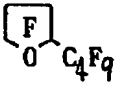
[0068] O : when desiccation JIMI is not observed visually.

[0069] O : it is 50 micrometers by the scanning electron microscope further. When the above silverfish is not observed.

[0070] The above measurement result is shown in Table 3.

[0071]

[Table 3]


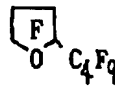

	水切り薬液 (質量部)	洗浄剤組成物(重量部)					洗浄結果		
		IPA	その他 有機溶剤	オクタメチルシクロ テトラシロキサン	ヘキサメチル ジシロキサン	ペルフルオロ 化合物	洗浄後の 外観	水分除去率 %	実用性能 (総合判定)
実施例8	オクタメチルシクロ テトラシロキサン	100	—	—	—	—	◎	99.8	◎
“ 9	99.5 ジエチレングリコール モノブチルエーテル 0.5	0.5	—	2.0	—	C ₈ F ₁₈ 97.5	◎	99.3	◎
“ 10	揮発性イソパラフィン 99.0 ステアリン酸 ナトリウム 1.0	—	7セトン0.5	2.0	—	 97.5	◎	99.1	◎
“ 11		—	—	—	—	C ₈ F ₁₈ 100	◎	99.5	◎
比較例3	フロン113/ 界面活性剤系 100	—	—	フロン113/ 界面活性剤系 100	—	—	◎	99.1	◎

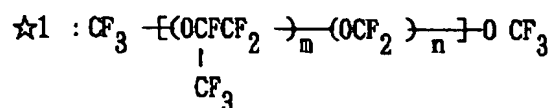
Even if it does not especially perform rinse washing according to each example so that clearly from the measurement result shown in Table 3, sufficient ridge nature is obtained. [0072] Examples 12-14, next the example of finishing washing (removal of particle) are described. Octamethylcyclotetrasiloxane and volatile isoparaffin were prepared as a finishing cleaning agent. Moreover, various kinds of things shown in Table 4 as a steamy cleaning agent were prepared, respectively. These cleaning agents were used and finishing washing of CCD cover glass was performed. The washing trial was carried out by performing desiccation finishing by steamy washing, after cleaning CCD cover glass ultrasonically in a 45-degree C finishing cleaning agent. And appearance evaluation after desiccation and measurement of a surface dust content were performed. The appearance after desiccation was evaluated like the above-mentioned example 8.

Moreover, the surface dust content (0.5 micrometers above) was measured using the particle checker and WM-1000 by the laser method (Tokyo Optical Co., Ltd. make). The above measurement result is shown in Table 4.

[0073]

[Table 4]

	洗浄組成物	洗浄組成物(重量部)					洗浄結果		
		IPA	その他 有機溶剤	オクタメチルシクロ テトラシロキサン	デカメチルシクロ ジシロキサン	ペルフルオロ 化合物	洗浄後の 外観	残留ダスト量 /0.5in ²	実用性能 (総合判定)
実施例12	オクタメチルシクロ テトラシロキサン	100	—	—	—	—	◎	15	◎
" 13	100	—	アセトン0.1	3	—	☆1 96.9	◎	12	◎
" 14	揮発性イソパラフィン 100	—	—	—	—	 100	◎	13	◎
比較例4	フロン113 100	—	フロン113 100	—	—	—	◎	20	◎
" 5	 100	—	—	—	—	 100	△ 研磨材 一掃残留	150	△



It turns out that sufficient particle control has accomplished in each example so that clearly from the measurement result shown in Table 4.

[0074] As shown in 15 to example 20 table 5, various kinds of organic solvents were added to volatile isoparaffin, and the cleaning cleaning agent was prepared. Moreover, volatile isoparaffin was prepared as a rinse cleaning agent. Using these cleaning agents, the printed circuit board

with flux was washed like the example 1, and desiccation evaluation by 50-degree C warm air desiccation was performed like the example 1. moreover, spindle oil is applied on a steel plate -- the heating furnace of 150 degree C performed baking of 48 hours, and the test piece was produced. Washing (ultrasonic cleaning) of the fats and oils adhering to this test piece was performed using the above-mentioned cleaning cleaning agent, and the time amount which that washing took was measured. It is shown that a detergency is so high that a numeric value is small. Those results are shown in Table 5.

[0075]

[Table 5]

実施例	有機溶剤	揮発性 イソパラフィン	クロシン	その他 炭化水素	フロン 113/ エタノール共沸系	乾燥時間 (秒)	イオン透過 ($\mu\text{gNaCl}/\text{in}^2$)	外観 (白色透過)	油除去時間 (秒)
15	エチルアルコール 2	98	—	—	—	40	11	◎	92
"	ジエチレングリコール モノブチルエーテル 50	50	—	—	—	180	9	◎	60
"	d-リモネン 30 エチルアルコール 10	60	—	—	—	120	7	◎	45
"	α -ピネン 30 IPA 10	60	—	—	—	130	5	◎	40
"	—	—	100	—	—	820	40	×	150
"	ジエチレングリコール モノブチルエーテル 30	—	—	n-デカン 70	—	630	15	×	162
比較例 6	—	—	—	イソアロピル ベンゼン100	—	>2,000	42	×	166
"	エチルアルコール 2	—	—	ジメチルベン ゼン 98	—	>2,000	14	○	135
"	—	—	—	—	100	20	11	◎	60

When a rinse was carried out by volatile isoparaffin after the cleaning agent used as a principal component washed isoparaffin so that clearly from Table 5 (examples 15-18), it was able to dry by warm air in a short time. Moreover, ion residue was also low and white residue was not seen, either. Furthermore, the fats-and-oils backwashing rate was also quick, and chlorofluocarbon 113 / ethane azeotropy system, and the engine performance more than equivalent were shown in respect of the washing engine performance. Moreover, when washing and a rinse were performed using straight chain-like paraffin, such as kerosine and n-Deccan, (examples 19 and 20), drying [by warm air] was better than the example which used alkylbenzene. On the other hand, drying [according to warm air by the case (examples 7 and 8 of a comparison) where washing and a rinse are performed using alkylbenzenes, such as isopropylbenzene and JIAMIRU benzene] was bad, or desiccation in 30 minutes was impossible. For this reason, there was also much ion residue and many flux components (white residue) which remained without the ability washing were also seen.

[0076] Using an example 21 - 22 volatility isoparaffin as a finishing cleaning agent, finishing washing of CCD cover glass was performed like the example 12, and a washing property and drying characteristics were evaluated like the example 12. In addition, desiccation was considered as 50-degree C warm air desiccation. The result is shown in Table 6.

[0077]

[Table 6]

	ゴミ除去工程に用いた溶剤	洗浄後の外観	残渣ダスト量 (/0.5in ²)
実施例 21	揮発性イソパラフィン	◎	100
” 22	n-デカン	○	350
比較例 9	イソプロピルベンゼン	30分でも乾燥せず ×	2,000
” 10	ジアミルベンゼン	×	2,600
” 11	フロン113/ エタノール共沸系	◎	90

In finishing washing using volatile isoparaffin or n-Deccan, there is also no desiccation JIMI after washing and it is also related with dust so that clearly from Table 6, and it is chlorofluocarbon 113. Equivalent detergency was shown. On the other hand, in each example of a comparison,

since drying was low, the dust content which many desiccation JIMI was seen and adhered during desiccation had also increased very much.

[0078] Using respectively the cleaning cleaning agent shown in 23 to example 28 table 7, a rinse cleaning agent, and a steamy cleaning agent, the printed circuit board with flux was washed like the example 1, and a washing property and drying characteristics were evaluated like the example 1. In addition, the conditions of cleaning washing and rinse washing were made into ultrasonic cleaning for 45 degrees C and 5 minutes. The result is shown in Table 7.

[0079]

[Table 7]

	洗浄工程 (組成、重量部)							洗浄工程	評価結果		
	揮発性イソパラフィン	有機溶剤	クロソソ	イソプロピルベンゼン	ジメチルベンゼン	n-デカン	フロン113/エタノール共蒸留		乾燥時間 (秒)	イオン残渣 ($\mu\text{gNaCl}/\text{in}^2$)	外観 (白色残渣)
実施例 23	98	エタノール 2	-	-	-	-	-	揮発性イソパラフィン	20	9	なし
" 24	96	エタノール 4	-	-	-	-	-	↑	15	6	なし
" 25	70	ジエチレンジクロール モノプロピエニル 30	-	-	-	-	-	↑	17	7	なし
" 26	30	ジエチレンジクロール モノプロピエニル 70	-	-	-	-	-	↑	15	8	なし
" 27	-	50	50	-	-	-	-	クロソソ	60	21	なし
" 28	-	-	-	-	-	100	-	n-デカン	45	38	乾燥済みあり
比較例 12	-	70	-	30	-	-	-	イソプロピルベンゼン	82	15	乾燥済みあり
" 13	-	20	-	-	80	-	-	ジメチルベンゼン	98	31	乾燥済みあり
" 14	-	-	-	-	-	-	100	←	25	9	なし


As a result of performing substrate washing using the cleaning agent and steamy cleaning agent which use isoparaffin as a principal component so that clearly from Table 7, it could dry in 15 seconds - 20 seconds, and there was also little ion residue and residual flux (white residue) was not seen, either. And chlorofluorocarbon 113/an ethanol azeotropy system, an EQC, or the engine performance beyond it was shown. Moreover, when substrate washing was performed using the cleaning agent and steamy cleaning agent which use kerosine and n-Deccan as a principal

component, effectiveness, such as drying characteristics better than the example of a comparison and compaction of the drying time, was acquired.

[0080] Using the ridge cleaning agent and steamy cleaning agent which are shown in 29 to example 32 table 8, ridge washing of a miniature bearing was performed like the example 8, and a washing property and drying characteristics were evaluated like the example 8. In addition, ridge washing is immersion rocking at 45 degrees C. It carried out for 1 minute. The result is shown in Table 8.

[0081]

[Table 8]

	洗浄工程(洗浄剤は、重量部)							洗浄工程	評価結果	
	揮発性イソパラフィン	ポリオキシエチレン オニールエーテル	ポリオキシエチレン ブチルフェニルエーテル	イソプロピル ベンゼン	シアミル ベンゼン	n- デカン	フロノ113/ 界面活性剤		外観	水分除去率 %
実施例 29	99.5	0.5	—	—	—	—	—	C ₆ F 14	◎	99.3
" 30	99.5	—	0.5	—	—	—	—	C ₈ F 18	◎	99.4
" 31	99.0	—	1.0	—	—	—	—	☆1	◎	99.6
" 32	—	—	0.5	—	—	99.5	—	C ₈ F 18	×	96
比較例 15	—	0.5	—	99.5	—	—	—	C ₆ F 14	×	91
" 16	—	1.0	—	—	99.0	—	—		×	89
" 17	—	—	—	—	—	—	100	←	◎	99.2

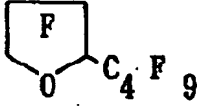
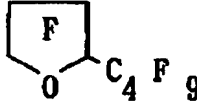
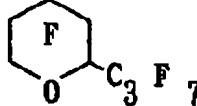
By the ridge using the ridge cleaning agent which uses volatile isoparaffin as a principal

component, it is satisfactory in the appearance after steam seasoning, and the moisture elimination factor also showed the value more than chlorofluorocarbon 113/a surfactant system, and an EQC so that clearly from Table 8. Moreover, when the ridge cleaning agent which uses n-Deccan as a principal component was used, the moisture elimination factor better than the example of a comparison was obtained. On the other hand, when alkylbenzene was used, moisture could not fully be removed but, for this reason, many moisture residuals and desiccation JIMI were seen.

[0082] Using the finishing cleaning agent and steamy cleaning agent which are shown in 33 to example 36 table 9, finishing washing of CCD cover glass was performed like the example 12, and a washing property and drying characteristics were evaluated like the example 12. The result is shown in Table 9.

[0083]

[Table 9]

	ゴミ除去工程	蒸気洗浄工程	外観	残留ダスト量 /in ²
実施例 33	揮発性イソパラフィン		◎	15
" 34	揮発性イソパラフィン	$[\text{CF}_3 \text{---} \underset{\text{CF}_3}{\underset{ }{\text{C}}}(\text{OCF}_2\text{CF}_2)_m(\text{OCF}_2)_n]\text{OCF}_3$	◎	18
" 35	クロシン		○	220
" 36	n-デカン		○	180
比較例 18	イソプロピルベンゼン	$[\text{CF}_3 \text{---} \underset{\text{CF}}{\underset{ }{\text{C}}}(\text{OCF}_2\text{CF}_2)_m(\text{OCF}_2)_n]\text{OCF}_3$	○	340
" 19	ジアミルベンゼン	C_6F_{14}	○	250
" 20	フロン113 (エタノール系)	←	◎	32

an example 37 -- as the cleaning agent in the 1st washing process -- the mixture of the hexa methyl disiloxane (SP value = 7) 50 weight section and the ethanol (SP value = 13) 50 weight section -- moreover, octamethylcyclotetrasiloxane was prepared as a rinse cleaning agent in the 2nd washing process. Moreover, C eight F18 was prepared as a steamy cleaning agent. When a washing property and drying characteristics were evaluated like the example 1 using these, the same good result as an example 1 was obtained.

[0084] SP value the cleaning agent in this example, i.e., hexa methyl disiloxane, and ethanol Although it is five or more, in order for the interaction of a polar group to show compatibility, a result which was described above is obtained.

[0085] As an example 38 perfluoro-compound To the C6 F 14 100 weight section, it is an

acetone as an organic silicon system cleaning agent considering hexa methyl disiloxane as 25 weight sections and an organic solvent. Three weight sections combination was carried out and the 1 liquid mold cleaner was prepared. on the other hand, the silicone system press oil YF33 (a trade name, Toshiba Silicone make) is applied to a steel plate -- what was able to be burned at 100 degree C was prepared as a test piece. And this test piece was washed using the top Norikazu liquid mold cleaner. For 40 degrees C and 3 minutes, washing conditions were made into ultrasonic cleaning and performed steamy washing with the same cleaning agent after this. [0086] Thus, when the washed steel plate front face was analyzed by ATIR, the peak equivalent to silicone did not appear but it checked that silicone residue did not exist.

[Translation done.]

*** NOTICES ***

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing typically the configuration of the washing station of one example of this invention.

[Drawing 2] It is drawing showing typically the configuration of the washing station of other examples of this invention.

[Description of Notations]

A Washing and water displacement process

B Defecation / ridge process

C, G Cleaning agent playback device

D Washing process

E Rinse washing process

F Desiccation process

1, 2, 7, 21, 22, 26 Washing tub

8 27 Shower rinse tub

30 Steamy washing (desiccation) tub

31 Steamy cleaning agent

D1 Ridge cleaning agent

D2 and D4 Cleaning agent of only a nonaqueous basic cleaning agent

D3 Cleaning cleaning agent

[Translation done.]

